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Co-operative Factories and Monopolies.

Those who are in the habit of looking a little below the surface of things may see more than at first appears in a press item regarding the production of glass in Indiana by establishments owned and operated by the workmen in co-operation. It is stated that these establishments are prosperous and that they are on the increase, and the significant point is made that "It is not possible for any trust to get a corner on the sand from which glass is made, and consequently there is no hindrance to the co-operative plan being applied to this industry."

Some time ago when there was an active labor trouble in the anthracite coal regions of Pennsylvania, an old miner recalled the day when an expert coal miner could go into the hills with a few tools and, working for himself, make wages, at taking out coal, that would be considered fabulous these days. But said he, "All the coal lands are now owned by the coal companies. That part of these lands [a very large part] which they are not using for mining operations they simply hold for the purpose of preventing others from using it, and a man must now work for one of these companies on its terms or not at all." And he might have added, "Thus these companies prevent free competition in the coal market on the one hand, and on the other are able to make terms with the miners which they could not come anywhere near making with them if coal, like the sand from which glass is made, could not be cornered by a trust." It seems to us that the two instances when contrasted are very illuminating and that among other things they may serve to show the essential difference between so-called trusts and trusts.

A commercial organization which has not, and perhaps cannot, control the supply of its raw material, and which cannot, or does not, control or monopolize in any way the means of transportation either of raw material or of finished product, must obviously depend for its success upon good management, *i. e.*, upon its ability to supply the public with a desirable article at a fair price, and so long as it does that and the conditions are such that any others—workmen co-operating among themselves or capitalists co-operating among themselves (in the form of joint stock companies or otherwise), can freely enter into the business and compete for trade, we do not see how any reasonable complaint can be brought against them, no matter how large they may be nor how many separate manufacturing establishments they may own. There is, it seems to us, entirely too much railing against "capital" and "capitalism." There is in fact scarcely any severer competition than is to be found among capitalists themselves. This competition is clearly shown in the bidding for municipal and other interest-bearing bonds which, when they are sold, bring a premium that reduces the net interest to the competitive rate for returns on capital, and that rate at the present time is somewhere about 2 per cent. This must be taken as the return which commercial operations of all kinds show to be about the average net interest received on capital, deducting for losses and for cost or value of supervision and management. There is no monopoly of capital; the competitive bidding for bonds and other forms of safe investments shows clearly that there is not, and workmen themselves by their own building and loan association operations and by the use that is made of their money by savings banks, may easily convince themselves that this is so.

On the other hand, capital may be used to secure harmful monopolies, but when this is the case it is the monopoly, not the capital, that injures others. In fact, many valuable monopolies, especially franchise monopolies, have been secured practically without the use of capital. They have been "granted" or given away by thoughtless or corrupt representatives of the people, and in such cases, though it is a little more clearly seen that it is monopoly and not capital that is the offender, it is no more true that it is so than in those cases where capital has been used merely to secure the monopoly.

When capital is used in such operations as co-operative glass making establishments, which establishments sell their product in the market in competition with other producers, it is, of course, manifest that there is no monopoly, no matter how much capital may be invested in the enterprise, nor how large the factory may be. But supposing it were possible to monopolize the supply of sand for glass making, and a portion of the capital were used for that purpose, and free competition of other establishments in that way prevented, it ought to be quite clear that it would not be capital that would be the oppressor, but the monopoly of sand, and we beg to suggest that much of the discussion of these subjects would be far more effective for real good if a little more discrimination were used. It is nonsense, for instance, to class a combination of tool building concerns, buying its material in the open markets and controlling no monopolies whatever, with, say, the Standard Oil Company, or the anthracite coal trust, both of which last mentioned concerns are successful chiefly because of having secured monopolies that prevent competition on equal terms.

Looking Backward.

It will be remembered that not long ago we commented on the fact that an officer of our United States Navy had recommended that a sailing ship be built for use by the naval academy in giving training to naval cadets, a curious claim being set

up that in order to handle a modern naval vessel that is all machinery, and has no sails, no masts, no bowsprit, and no anything much that characterized the old naval vessel propelled by wind, cadets must have training on a vessel that has all these things and no engines, boilers, funnels, coal bunkers, dynamos, nor anything that characterizes a modern naval vessel. This view is largely held, we believe, in the British Navy, but (without sufficient reason, perhaps) we looked for something different here. Nevertheless, such a ship was actually built for our navy, and we seem to be going backward at just about the time when there are men in the British Navy who evidently perceive that it is important and needful to go the other way. They have been discussing the same matter over there, and one of their rear admirals, who has been especially prominent in urging the view that the proper place to train men for service on a steamer is on a *steamer*, says:

"It seems very strange that so many of our officers continue to look back instead of looking forward."

When he has turned all the British naval officers in the right direction, let him come over here; there is use for him.

Experience of American Machinists in China.

"A great many skilled machinists and engineers have gone to China from this country during the past ten years," said the captain of a large cargo steamer, who has made frequent trips to the flowery kingdom. "Most of them were engaged to take charge of big plants, and while the job seemed tip-top on the surface the result was nearly always disappointing. The Chinese are very anxious to avail themselves of foreign skill, but take care to dispense with it at the earliest possible moment. A manufacturer, for example, will put in modern machinery and hire an American expert as a superintendent, giving him a couple of sleepy-looking young Chinamen as assistants. In six months the sleepy-looking pair have mastered all the technicalities of the plant and some pretext is found for getting rid of the American.

"The fact that he has a five or ten-year contract is no special obstacle. All labor contracts may be voided for good cause, and in China there is never any difficulty in proving anything you like about a man. I knew an Ohio engineer who went to Canton several years ago to set up and operate a large plant in a silk mill. He was under a five-year contract at $6,000, gold, per annum, and thought he had a soft thing. Before his first year had elapsed he was discharged on the ground of habitual drunkenness, neglect of duty, waste of material, insubordination and a dozen or so other little things I have forgotten. Being entirely innocent, he showed fight, but was overwhelmed by a cloud of witnesses and the case against him was made so strong that the consul refused to interfere. His place was taken by his native assistant, who made a botch of it and destroyed thousands of dollars' worth of costly machinery, but that didn't help the engineer who was sacked. American experts who know the ropes insist upon having a clause in their contracts authorizing them to employ their own assistants.—New Orleans "Times-Democrat."

A Veteran Foundry Foreman.

Thomas Preston recently celebrated his eightieth birthday and the fiftieth anniversary of his foremanship of the foundry of the H. R. Worthington Hydraulic Works, at Elizabeth, N. J. We take the following particulars of his life from an article in the latest issue of "The Foundry:" Mr. Preston was born at Stoke, England; came to this country at the age of twenty-one, and worked first for Boothouse & Abendroth, Port Chester, N. J. After being employed in two or three different foundries, each having a different line of work, from which he gained valuable experience, he became foreman of the Worthington foundry fifty years ago, and has been continuously in that position to this day. He is always at his duties and is on his feet from morning to night. There were but two molders in the foundry when he began, and the production of cylinders and other large pieces often taxed his ingenuity and his resources. Mr. Preston has always been a man of progressive ideas and a leader in adopting and often originating improvements in foundry practice. He was one of the first to see the advantage of coke melting. He early adopted the molding machine, and his foundry has become one of the leading users of these machines, where they are probably employed upon a wider variety of work than at any other place. Mr. Preston was tendered a banquet by his fellow workmen and old associates, by whom he was presented with a gold watch, chain and charm.

The "Variag."

Notwithstanding the unfortunate accident to the "Variag," the new Russian cruiser built by the Cramps, in the breaking of a high-pressure cylinder before the completion of her final trial run, she is undoubtedly a great success, and the fastest ship of her class in the world. The test to which the "Variag" was finally subjected was a more severe one than the ships of our own navy are subjected to. She was required to make a continuous run of twelve hours' duration at a sustained speed of 23 knots, and the cylinder gave out after running 7½ hours. Fortunately no one was hurt. The required speed was exceeded by .6 to .7 knot for the entire time that the run continued. On a previous and shorter trial she had attained a speed of 24.6 knots, and it is asserted that she will undoubtedly reach 25 knots when at her best. The Niclausse water tube boilers, the first of that type to be installed in an American-built ship, gave a good account of themselves. Both in steaming and in facility of firing they exceeded expectations. The full horse-power required was easily produced under natural draft, and with 10 per cent. of her furnaces out of use for cleaning and hoisting ashes. The mean horse-power developed when running at 23.7 knots was about 17,000. It is understood that it will take four or five weeks to replace the high-pressure cylinder.

The Taylor-White Process of Treating Tool Steel.

By invitation of the Bethlehem Steel Company, representatives of various technical papers attended an exhibition of lathe tools treated by the Taylor-White process at Bethlehem, July 31. The exhibition consisted of showing the operation of the treated tools in comparison with others of Mushet steel—the speed of the lathe being above that at which the Mushet tools would endure for any length of time. Cast iron, tool steel and soft steel were operated upon—the last named at a circumferential speed of 150 feet per minute without water, and without destruction of the treated tools. The appearance of a large lathe turning a 17-inch steel shaft at this speed is nothing less than startling. We expect to present a full account of the exhibition in our next week's issue.

Commercial Review.

NEW YORK, Saturday, August 4, 1900.

MACHINISTS' SUPPLY MARKET AND MACHINERY IN GENERAL.

If it is as much trouble to get orders as to get news this month, trade must be dull indeed. In fact, the supply market is quiet without any mistake. Yet it is not regarded as more so than ordinarily at this time in a presidential campaign year, when trade is in a healthy condition. A resumption of important buying on the part of consumers in September is confidently awaited. The jobbers might be expected to lay in stocks somewhat earlier, say from the middle of this month, which would hasten the recovery of business from a manufacturer's standpoint. At present stock orders are light, specifications rule small, to cover present necessities only, and the effects of inquisitiveness into the future movements of prices are still manifest. Values in general seem to be steadier than they were. Drills, files and the like have held their own to date.

It is reported that the Edward P. Allis Company has received the contract to furnish the engines for the important extensions to the Sydney tramways which Charles Oliver, commissioner from the government of New South Wales, has

been in this country to purchase. We expect to give fuller details of the contracts for this equipment in our next issue.

The German Garvin Machine Company, which has been under way for about a year past and which is being equipped with tools from this country, is expected to be set running in a month or two. A few of the tools intended for it were lost in the Hoboken wharf fire. Skilled mechanics from this country are being sent over to superintend the various departments. It is likely that George K. Garvin will go to Berlin in September or October, at the time of the opening.

A very encouraging state of affairs exists at the works of the Brown & Sharpe Manufacturing Company. They are at present employing 2,400 people, which is more than ever before, and are building an addition to their works which will add from one-fourth to one-third to its present floor space. One wing of this building is 180x50 feet, the other 110x50, and both five stories high. This new building shows that the Brown & Sharpe Company believes in the advantages of the substantial and relatively expensive style of construction adopted by them years ago, for in this they are carrying that principle still further, the new building being the best one yet erected by them. The most notable difference perhaps is in running the windows up close to the ceilings to improve the lighting. They report business good, and better than it was a short time ago. As regards this, there is used in that establishment a somewhat unique trade barometer. It is kept in the room from which machinists' small tools are shipped. If the boxes of steel rules, calipers, etc., that are sold by themselves and the hardware dealers to machinists throughout the country are numerous and increasing, they conclude business is good and per contra. Experience has shown them that this is practically an infallible guide—they think the best one connected with their business, and when we consider what motives impel machinists to buy or to refrain from buying steel rules, micrometer calipers, etc., the reason why this is a good trade barometer becomes apparent.

In pursuance of a fixed custom, the Brown & Sharpe Manufacturing Company will close its works for two weeks this summer for vacation and repairs. The suspension of work is from August 6 to 18 inclusive. The office, however, will be kept open for orders in the meantime.

A wood pulley agent who has been traveling in New England found that the hat factories there had been visited by their summer quiet spell about a month later than usual, but they did not appear to be expecting it to remain until a month later for that reason. Perhaps the same may be said to be true of machinery and supplies. Summer dullness did not come early this year, and, barring the election, there is no reason to suppose that it will not be followed by a speedy recovery.

There is at Havana, Cuba, a scientific school, the "Escuela de Artes y Officions de la Habana," which was started under the Spanish regimè and is being carried out under United States Government patronage. Material and equipment for this school are being furnished by J. F. Rogers, of New York, who has sent down already the iron work for the building, machine tools, some five pieces of wood-working machinery, etc. Some good-sized Putnam lathes were among the tools shipped, and the last consignment comprised two Cincinnati milling machines. Requirements have later been received for a direct-connected dynamo and engine of about 100 lights and a quantity of laboratory apparatus for soil analysis. The last named has direct reference to local necessities. Determinations will be made at the school of the values of soils for producing sugar, coffee and tobacco, enabling them to be devoted to the branch of agriculture to which they are best adapted. Mr. Rogers has already forwarded a machine for cutting tobacco.

A complete sawmill outfit, including engine and boiler, has recently been shipped by Mr. Rogers to a Cuban mill for working Spanish cedar and mahogany. He has recently sent another sawmill outfit to Brazil. Planers, edgers, drag saws, engine and boiler were included among the machinery. The size of this plant may be inferred from the fact that a part of it alone weighed 22 tons, and the freight amounted to $1,000.

Mr. Rogers, who is an old-timer in the Cuban market, is very well pleased with the present demand for machinery there, although he says that affairs are somewhat disturbed, owing to the uncertainty as to the future form of government. This opinion is rather more favorable than one which we have heard from another source.

FOREIGN NOTES.

Ten years' extension has, by imperial decree, been added to the time during which machines and material necessary to the creation of factories in Turkey may enter free of duty.

The Turkish Council of State has been considering projects for the construction of a tramway line and canals at the city of Basra, near the Persian Gulf. These projects, accompanied by the mazbata of the Council of State, have been transmitted to the Grand Vizirate. The applicant is an important man of Bagdad, Patchadji zadé Abdul Rahman effendi.

The Société hellénique d'électricité, of Athens, Greece, which has already undertaken the lighting of several Greek cities, has obtained the concession for electric lighting of the strait or canal of Euripus. The French minister at Athens learns that it is proposed to use the water current of the strait to generate power, and a French paper thinks this may interest their manufacturers of turbines. Probably it will interest American ones just as much. In default of this system, recourse will be had to gas engines.

The German manufacturers of machinery and metal wares have for some time past had their faces set toward Russia, and in furtherance of their plans some of them are now proposing to hold an exhibition in Moscow. A preliminary hearing was given to the matter at the Russian Office of the Interior about the end of May.

We do not know that it has hitherto been bruited on this side of the Atlantic that Germany—or a small faction of that nation, at least—is agitating for holding the next world's fair in Berlin. A German paper throws a little cold water upon the scheme. The last Berlin trade exposition, it says, was accompanied by the worst of weather and had no particular results except a big deficit. Berlin is badly situated for a world's fair, and hasn't a suitable site for it. To careful observers, it says, the fact is becoming more apparent that the time for world's fairs is past, and that the one in Paris ought to be the last of its kind.

PITTSBURGH REPORT.

Competition in the iron and steel trades is having the effect of bringing prices down at a very good clip, and the fierceness for trade is becoming more pronounced each day. This competition is between the combinations and the larger individual concerns throughout this territory. It was thought that the meeting held some few days ago in Chicago by the manufacturers would have the effect of straightening out matters, but as there was nothing decided it is thought by many that the failure to come to some understanding is the principal reason why the slashing of prices was begun. Steel bars went as low as 90 cents per 100 pounds, the lowest price recorded for this material for two years. It is said that one of the combinations disposed of a large quantity of bars at this price, but as $1.15 per 100 pounds was the nominal figure, many were inclined to believe that the story was "fishy." It developed later on that bars were being sold in Pittsburgh for 1 cent a pound, but these sales were in exceptional business. The cut in the price for bars has been the most disturbing act since the steel and wire cut of a few weeks ago.

Outside of the bar market there has been nothing special doing in the general line of business. There has been a little freer buying and inquiries are coming in better and with slightly more urgency, which tends to give a somewhat improved appearance to the situation. The raw, and some of the semi-finished, lines of iron and steel are practically dead, and there is nothing doing in Bessemer billets to show that there is any market. Foundry iron has little show, and it is hardly likely anything will appear on the surface until the stocks from which the low-priced finished stuff is made has been disposed of.

The different plants are running well

and have orders to keep them busy for a while. The Petroleum Iron Works Company, Washington, Pa., has secured another order from the Risdon Iron and Locomotive Works, San Francisco, Cal., for a 35,000-gallon tank for the storage of oil for the railroads entering Bakersfield, Cal. The tank will have a steel riveted roof, and will be made of ⅜-inch steel.

Rumor has it that the Carroll-Porter Boiler and Tank Company, Pittsburgh, whose plant was recently destroyed by fire, is looking for another location, and has an offer before the Newport (Ky.) Board of Trade. The Columbia Bridge Company, Pittsburgh, with works at Edenburg, is to enlarge its plant in the very near future. The company is enjoying a brisk business, and finds the present shops entirely too small for the taking care of its orders.

Walker & Slater, Washington, Pa., contractors and lumber workers, will install a gas engine some time during the coming fall.

CHICAGO MACHINERY MARKET.

The dominant note in the machine tool trade is hesitation, the variations running to special tool sales. The hesitation is seasonable, and moreover has several extraneous aids to its natural strength. The buyer is influenced by recession in values in crude material, and is expectant of a like change in tools. Within the past two weeks bars and similar forms of raw material have suffered a relapse from former quotations, owing to a sharp competition among the large producing companies, and this has given to buyers a keynote, which, however false, rules the trade in goodly measure. There are few shops that are running overtime; few that are even running to their full capacity during July and August. The actual requirements for new machinery are therefore at their lowest ebb, and the business that is current runs largely to one or two machines, not to a half-dozen or a score, as it did not so long ago. Within the past few weeks there have not been many new machine tool outfits sold in the West. But with ordinary tools thus quiet, a quite fair trade is reported by the sellers of special machinery. Electric cranes, for example, have been having a remarkably good market, the sales of one producer during the past month having exceeded $100,000, orders coming from all parts of the country, largely in the iron centers.

It is not uncommon to hear the Pacific Coast mentioned as a fruitful region for the machine trade just now. From all accounts there is quite a spurt in manufacturing interests there, the demand for machinery embracing both wood and iron working machine tools. The stir has reference largely to the ocean trade, the channels to Alaska, the Hawaiian Islands and Asia all showing a marked expansion, with a development of industries contributing to that expansion.

While actual business has been moderate, the inquiries for machinery form quite another story—one of promise and high expectation. A considerably less percentage than usual of these inquiries terminate in quick purchases, and one reason for this is that deliveries can now be arranged for most tools on time to suit the purchaser. There is not the necessity of buying for fall delivery several months in advance, as there was a year ago, and with no prospects of a stringency in the market the trend of present trade seems to be to delay buying as long as possible.

Among orders recently secured by the Marshall & Huschart Machinery Company was one for $11,000 worth of large machines for the United States Navy Yard at Puget Sound.

Rudolphi & Krummel report July business just about average for the past year, the last two weeks showing better results than the first two. Buying is mainly for special machinery.

CINCINNATI REPORT.

A summary of the situation in the local machine tool market shows that the last half of July and thus far in August have been the most satisfactory periods of the summer for manufacturers in that line. Dealers all over the country have been reducing their stocks to such an extent that it is believed from now on they will be steady buyers for their ordinary requirements. The Chinese war has apparently had no effect on the trade in this section of the country. Foreign trade, generally, however, has fallen off considerably, and domestic has the pull. The local manufacturers of high grade goods report themselves highly pleased with the situation and future prospects. One large jobbing house which deals exclusively in the better class of machine tools, lathes, drills and shapers, reports August as having commenced phenomenally well. There is considerable inquiry from foreign countries, and several representatives of foreign houses or governments have been in the city during the past week. President March, of the Cincinnati Shaper Company, is exceedingly well pleased with the situation as viewed from the output standpoint of that concern. Fifteen machines were shipped during the week, and all of a high grade. The Bickford Drill and Tool Company, the Niles Tool Works Company, of Hamilton, the Bradford Machine Tool Company, the R. K. LeBlond Machine Tool Company, the Hamilton Machine Tool Company, of Hamilton, the Cincinnati Milling Machine Company and the Long & Allstatter Company report business exceedingly good during the past week, and improving.

A somewhat singular situation exists in this section among the larger manufacturers of boilers. The Tudor Boiler Manufacturing Company and others of similar prominence say that it is extremely quiet just now, which is a radically different situation from that which existed just one year ago. Last year August opened big with the boiler people. All report an unusually large number of inquiries, and that there is plenty of business hanging fire, but for some reason buyers are holding off. A large number of power installations the last two or three months have kept the boiler makers busy up to the present time. Prices have declined, somewhat, but in the opinion of conservative manufacturers prospects for the future are exceedingly good. Buying seems to be about equally distributed in the machine tool and allied lines. A number of the larger local concerns are figuring on establishing an elaborate exhibit, perhaps a co-operative affair, in the coming Fall Festival to be held here September 19 to 29.

The exceedingly large business done by the Bullock Electric Manufacturing Company abroad has made it necessary to establish larger offices in New York, and Mr. Bolles, who has hitherto been in charge of the advanced department in Cincinnati, will henceforth make his headquarters in the metropolis.

Quotations.

NEW YORK, Monday Aug. 6, 1900.

Iron—American Pig, tidewater delivery:—

Pennsylvania Irons:

No. 1 X foundry	$16 75 @ $17 25
No. 2 X foundry	15 75 @ 16 25
No. 2 plain	15 25 @ 15 75

Alabama Irons:

No. 1 foundry, or soft	18 75 @ 20 25
No. 2 foundry, or soft	17 75 @ 19 25
No. 3 foundry	16 75 @ 18 50
Foundry forge	15 75 @ 16 25

Bar Iron—Base sizes—The price on dock is 1.35 @ 1.45c. for refined brands, and about 1.80 @ 2c. for same from store. But in view of the bearish reports important concessions by mills seem not impossible.

Tool Steel—Base sizes—Good standard quality, 7 @ 8c.; extra grades, 10 @ 14c.; special grades, 16c. and upward.

Machinery Steel — Base sizes — From store, 1.80 @ 1.90c.

Cold Rolled Steel Shafting—Base sizes —From store, 3c.

Copper—Lake Superior ingot, 16½ @ 16¾c.; electrolytic, 16⅜ @ 16½c.; casting 16⅜c.

Pig Tin—32⅜ @ 32⅝c. for 5 and 10-ton lots, f. o. b.

Lead—For wholesale lots, 4¼c., with .02½ @ .05c. extra for carloads, New York.

Spelter—Prime Western, 4.25 @ 4.30c., New York delivery.

Antimony — Cookson's, 10¾ @ 11c.; Hallett's, 9½c.; United States, 9⅜ @ 9½c.; Japanese and Hungarian, 9.15c., upward.

Lard Oil—Prime City, present make, in 1 to 5-barrel lots, 55 @ 57c.

A Drill Jig for Acetylene Gas Burners.

BY JOSEPH V. WOODWORTH.

The work to be drilled was a solid casting of composition of the shape shown in Fig. 1, which had been dropped in a forming die under the drop hammer and then run through a trimming die to have each of the same shape and size. After the hole *R*, Fig. 1, had been drilled and tapped in the monitor the piece was ready for the jig. This is shown from the side and front in Figs. 2 and 3. *O*, *N*, *P* and *Q*, Fig. 1, are the holes to be drilled in the burner. *O* and *N* were drilled to No. 17 and *P* and *Q* to No. 40 drill gage size. The small holes were afterwards soldered at the top, thereby leaving two clear passages for the gas.

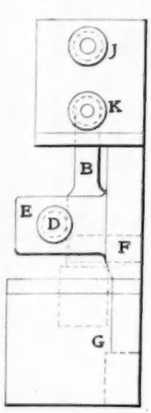


Fig. 2

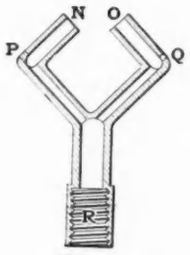


Fig. 1

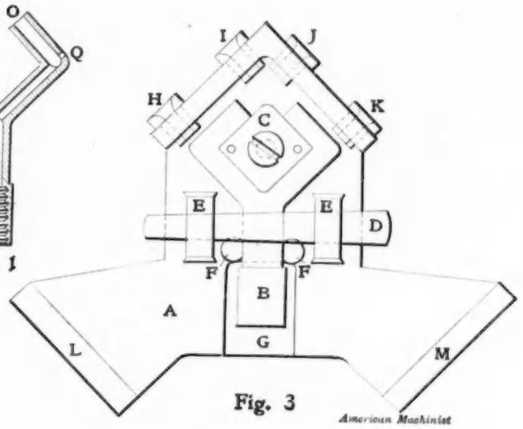


Fig. 3

American Machinist

JIG FOR DRILLING BURNERS.

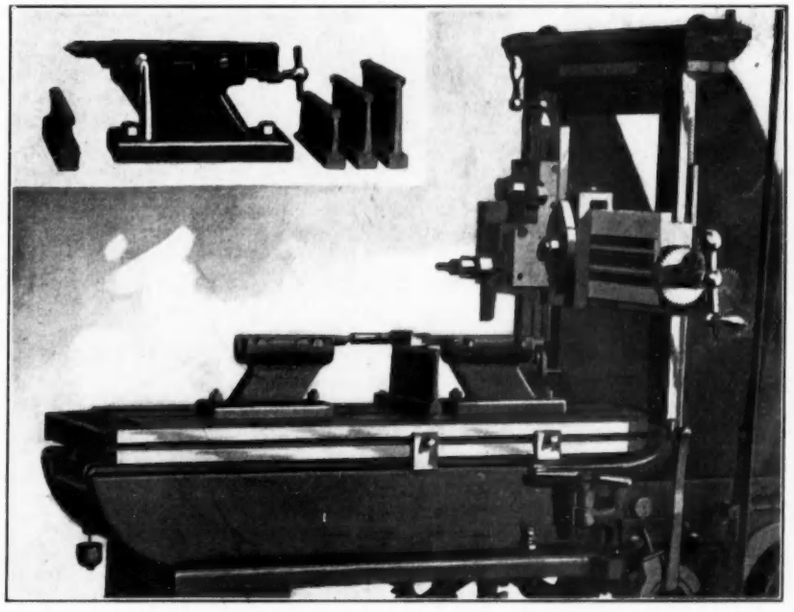
The jig itself was a casting, flat at the back, with three projections, one at the top to hold the bushings, and two, *L* and *M*, at the base; also the two lugs *E E*. In the first place a piece of 5-16 inch thick flat machine steel was planed square, worked down and finished as shown at *C*, Fig. 3, so as to fit the square inside the burner and act as a gage plate to locate and hold it. It was then fastened with the central screw and the two dowel pins. *F F* were two Stubs steel pins ¼ inch in diameter, filed on the inside of each so that the burner would drop freely, but without play, between them. Next a taper hole was drilled through the two lugs *E E*, and the lock pin *D* fitted in, with the side bearing on the work flatted. The work *B* was then put in place and the lock pin *D* driven in, thereby holding the work fast and snug. The bushings *H*, *I*, *J* and *K* were then made, hardened and lapped to size. The holes for the bushings were then laid out, drilled and reamed to size and the bushings driven in. The drilling was done in a two-spindle drill. First, the jig was stood up on the base *M*, and the holes *O* and *P* drilled, then on the base *L* and the holes *P* and *Q* drilled; then, taking out the lock pin *D*, the work was easily removed. The jig worked very satisfactorily, each boy drilling from 950 to 1,050 a day. We made three duplicates and used them continually. The casting was sunk in at *G* to give clearance to the work at *B*.

Brooklyn, N. Y.

Planer Centers and Parallel Blocks.

The half-tone shows a pair of centers of new design in use upon a planer. They may of course be used upon a milling machine, shaper or elsewhere. A set of parallel blocking for use in connection with the centers also appears. The centers are planed with tongues to fit the slot in the platen, and are each fastened by two bolts in the usual way. The center slides are dovetailed and gibbed. The screw for the longitudinal movement of the back center is out of the way. When the centers are tightened to hold the piece of work, the gib is set up by the forward screw, and the work is held securely. The socket wrench on the screw may then be removed or not, as required. The top sides of the center slides and of the centers are flatted off so that the tool can work to within ¼ inch of the center. The centers are of course made of tool steel and hardened.

The set of parallel blocks consists of one base with an inclined tongued face and four blocks of successively increasing hights to fit upon it. The set covers all intermediate hights between that of the lowest and the highest, the latter coming up to the hight of the center. In using the parallels the distance piece nearest the required hight is used. The top piece is then pushed along the base until it bears properly under the work. Connected to the base piece is a small extension spring with a brass chain attached, the spring fastened to the base piece and the chain fastened to a small pin in the top piece. This keeps the parallel up to the work, only a small tension being required. These centers and parallels are made by C. O. Lucas & Co., Greenville, Ohio.



PLANER CENTERS AND PARALLEL BLOCKS.

New Screw Cutting and Feeding Attachment for Lathes, Etc.,

The half-tone, Fig. 1, and drawing, Figs. 2-7, show a new method of driving the lead screw and feed mechanism of an engine lathe which enables the operator to instantly change the screw cutting pitch (or the feed), within the usual range of such changes, without the necessity of selecting or handling the gears to be changed. This attachment is designed to be applicable to all makes of engine lathes, can be applied to lathes already in use, and can be used for feeding as well as for screw-cutting where the lead screw is splined or where the lead screw and feed rod are connected by gearing.

Figs. 3, 5, 6, 7 show a slotted plate *D*, which is arranged to be bolted to the slotted stud plate or quadrant, or to the

end of the lathe bed. The crank-shaped casting G has a sleeve which passes through and supports casing K. K^1 is fitted into plate D^3, and is provided with circular slots and clamping screws for adjusting the intermediate gear D^2 and holding it firmly in position. The first driving gear of the series is D^1 on the main spindle of the lathe, or on the revolving stud of the lathe head. When on the main spindle it meshes into and drives the intermediate gear D^2, which in turn drives the gear D on shaft C. But, in most cases, when gear D^1 is on the headstock stud, the intermediate gear D^2 may be removed and the first driving gear meshed directly with the gear on shaft C. This central driving shaft C takes its bearing through the sleeve of casting G, and its outer end is splined to receive gear E or F. The knurled nut C^1 holds these gears in position.

In Figs. 3 and 4 the several change gears, it will be seen, are permanently mounted upon different revolving hollow studs or spindles within the two-part circular casing K and K^1. The hollow spindles are provided with clutches at either end, and they take their motion on the outer end from the clutch F^1. This clutch is mounted on a steel stem F^2, which precedes it into the hollow spindle O with which it is to be engaged, and is splined to fit gear F, which meshes with gear E on the central driving shaft C. The hub of casing K, which fits the sleeve of crank G, keeps the casing concentric with the driving shaft C. The outside of this hub, however, is eccentric, as may be seen in dotted lines in Fig. 2, or in section in Fig. 3. Upon this eccentric the gears N^1 N^2 turn freely. These gears have each the same number of teeth, they are doweled together, and, although one is 10 pitch and the other 11 pitch, they form practically a single intermediate gear. The reason for making one half of this intermediate of a finer pitch than the other half is to reduce its diameter, and thus to make room for the gears meshing into it which have the greatest number of teeth. The eccentricity of these intermediate gears also makes it possible to place the stems of all the gears, each with a different number of teeth, in a concentric circle A B, and yet all meshing correctly into the intermediate gear N^1 N^2. In Fig. 4, which is a section on the line A B produced, it will be seen that the smallest gears are placed where the periphery of the intermediate gear N^1 N^2 comes nearest to the line A B, and the largest are where the distance is greatest. The nine change gears are always in mesh with the intermediate gear, some with N^1 and some with N^2, and when any gear turns or when any gear is driven, all the gears are driven, but the series will be driven at nine different speeds according to which of the change gears is driven by the clutch F^1. The clutch F^1 may of course be withdrawn and engaged so that either of the nine gears may be so clutched and driven.

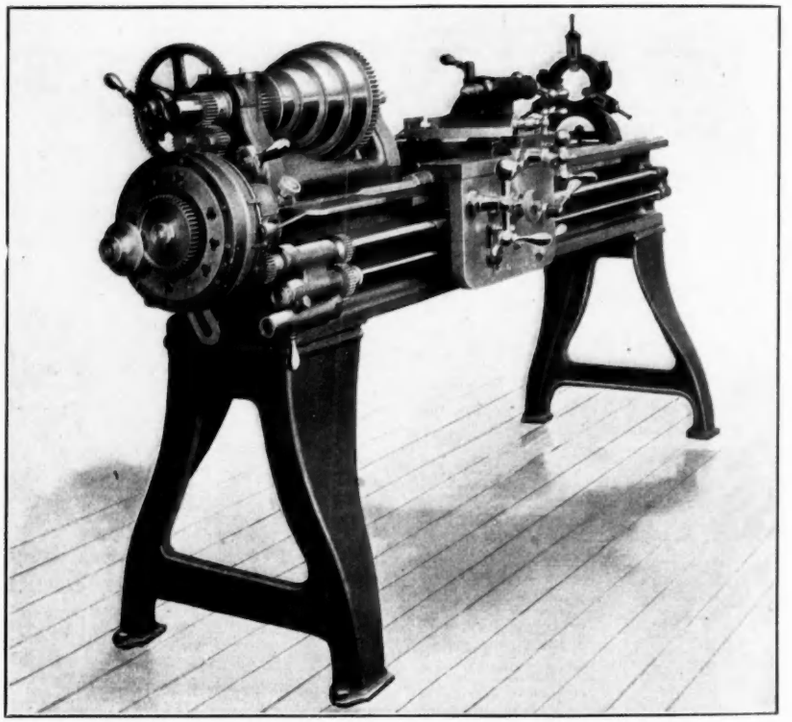
It will be noticed in Fig. 3 that the gear spindles are also clutched at their right-hand ends, and can be connected to the sliding clutches P P^1 contained within the bearings of the slotted plate D^3. These clutches are engaged and disengaged by turning the knurl P^2, as indicated by the arrows stamped upon it.

Upon the clutches P P^1 are splined the gears J J^1 of equal numbers of teeth. They are meshed together, and of course run in opposite directions. The lower one, J^1 meshes with the lead screw or driven gear I. The casing K K^1 is rotatably mounted and can be turned to any desired position, indicated by the pointers stamped "Right" and "Left" (see Fig. 7). The knurl P^2 is then turned in the direction designated by the arrow, and either of the driven gears J or J^1 may be connected to the selected gear in the casing. When J is driven directly by the change gear in the casing, it will be seen that J^1 acts as an intermediate, transmitting motion to the gear I on the screw in one direction, and when J^1 is the driven gear, J runs idly, and the screw is driven in the opposite direction. The pointers stamped "Right" and "Left" are made interchangeable, in order to adjust them to lathes having either right or left hand screws.

The pin extending beyond the face of the clutches P P^1 enters the hollow spindle in the casing and holds it from turning, and the lead screw gear I is driven from the gear spindle to which it is clutched. The clamp P^4, which fits into the groove in casing K^1, is provided to hold the casing firmly under strains.

The figures on the casing indicate the position of the nine gears, these numerals being used in connection with an index shown in Fig. 7, for setting the different feeds and pitches.

The spindle of the smallest gear O is not provided with a clutch for driving gears J J^1, being used only to clutch F^1, and thus to drive the gear N^1 when its speed ratio is required. As the clutch F^1 may be withdrawn and inserted into nine different positions upon the outside of the casing, each giving a different rotation speed to the entire series of gears in the casing, and as the casing for each of the above positions of the clutch F^1 may be turned to eight different positions, each giving a different rotation to the lead screw, the total number of different combinations will be $9 \times 8 = 72$, and these will be, by reversing gears E and F, $72 \times 2 = 144$. There will, however, in this series of speeds be several repetitions, so that the number of different speeds will actually be 126.



NEW SCREW CUTTING AND FEEDING ATTACHMENT APPLIED TO A LATHE.

This attachment may, of course, be applied to other machine tools as well as to lathes. It is brought out from the designs of W. L. Schellenbach, and is manufactured under his supervision by the National Machine Tool Company, 208 Lawrence street, Cincinnati, Ohio.

"The Engineer" has discovered that stops are shorter on our elevated railroads than on the London underground, notwithstanding the numerous side doors, and says it is "at first sight remarkable." No explanation is given by our contemporary, but that is not needed. It has been explained.

Austria-Hungary's Machinery and Tool Trade in 1899.

The Austrian Government has just published detailed statistics on the foreign trade of the Austro-Hungarian monarchy for the year 1899, from which we gather that the imports of machinery, apparatus and parts thereof amounted in value to 46,014,254 florins (or about $18,402,000), as against 43,546,798 florins in 1898 and 39,352,844 florins in 1897. The exports of the same class of goods amounted in value to 14,371,792 florins.

The Austro-Hungarian machinery market is to a very large extent in the hands of German manufacturers. To the above imports in 1899 of 46,014,254 florins, Germany contributed no less than 26,902,976 florins worth, or more than 55 per cent. Great Britain takes the second place, with a contribution amounting to the respectable value of 11,353,272 florins, or about 25 per cent.; then comes Switzerland, with 2,951,566 florins, or about 7 per cent., while the fourth place is occupied by the United States, with 2,365,636 florins, or only 5 per cent. of the total trade.

To what extent American manufacturers have participated in the Austro-Hungarian machinery and tool trade will be seen from the following figures: Thirty-three locomotives, valued at 344,890 florins, were imported in 1899. Of these 32 came from Germany and 1 from France. A large demand existed for portable engines, of which 413, valued at 2,219,616 florins, were imported. Of these Great British sent 1,48,412 florins and Germany 708,696 florins' worth, while our share amounted to only 6,372 florins. The rest came from Belgium and Switzerland. Textile machinery came almost entirely from Great Britain, though, especially during the last few years, German and Swiss manufacturers have made the most strenuous efforts to gain a firmer foothold on the Austro-Hungarian market, and it seems that they are meeting with success.

The principal items of these imports were, in round figures: Cotton machinery, 2,100,000 florins; silk looms, 710,000 florins; other looms, 1,860,500 florins; embroidery machinery, 1,181,692 florins.

Agricultural machines are classified in the official returns as follows:

Steam plows, 786,940 florins; almost entirely from Great Britain and Germany. Nothing from the United States. Threshing machines, 1,228,832 florins, of which 1,098,328 florins' worth came from Great Britain, 125,136 from Germany and 4,664 florins' worth from the United States. All other agricultural machinery, 1,350,160 florins, of which 785,280 from Germany and 416,880 florins from United States.

An item which will chiefly interest our readers is that of "Machine Tools, or Metal-Working Machinery." The imports during the last four years were as follows: 1896, 974,814 florins; 1897, 1,423,632 florins; 1898, 1,796,184 florins; 1899, 2,212,626 florins. Thus, it will be seen that the imports have steadily and largely increased.

Although Austria-Hungary takes the third place among the European states, both as regards area and population, its industries remain rather behind those of smaller countries; for instance, France. During the last few years, however, great efforts have been made to develop the home industries, and the Austrian machine shops have been very busy during this time. Although in most prominent Austrian shops some American machines (at least a lathe or a drill press) can be found, yet the great bulk of machine tools is still imported from Germany. To the imports of 1899 Germany contributed no less than 1,286,832 florins, or about 60 per cent. The second place, however, was held by the United States, with 786,942 florins. According to our own statistics, our exports of metal-working machinery to Austria-Hungary during the last fiscal year amounted to but $118,483, but it is a well-known fact that almost all our shipments to Austria are made via Hamburg, or some other Continental port. Out of the above 786,942 florins, representing our exports of machine tools to Austria, only 570 florins' worth were shipped via Trieste, while the bulk passed over the Continental railways. Great Britain's share in Austria-Hungary's machine tool trade is

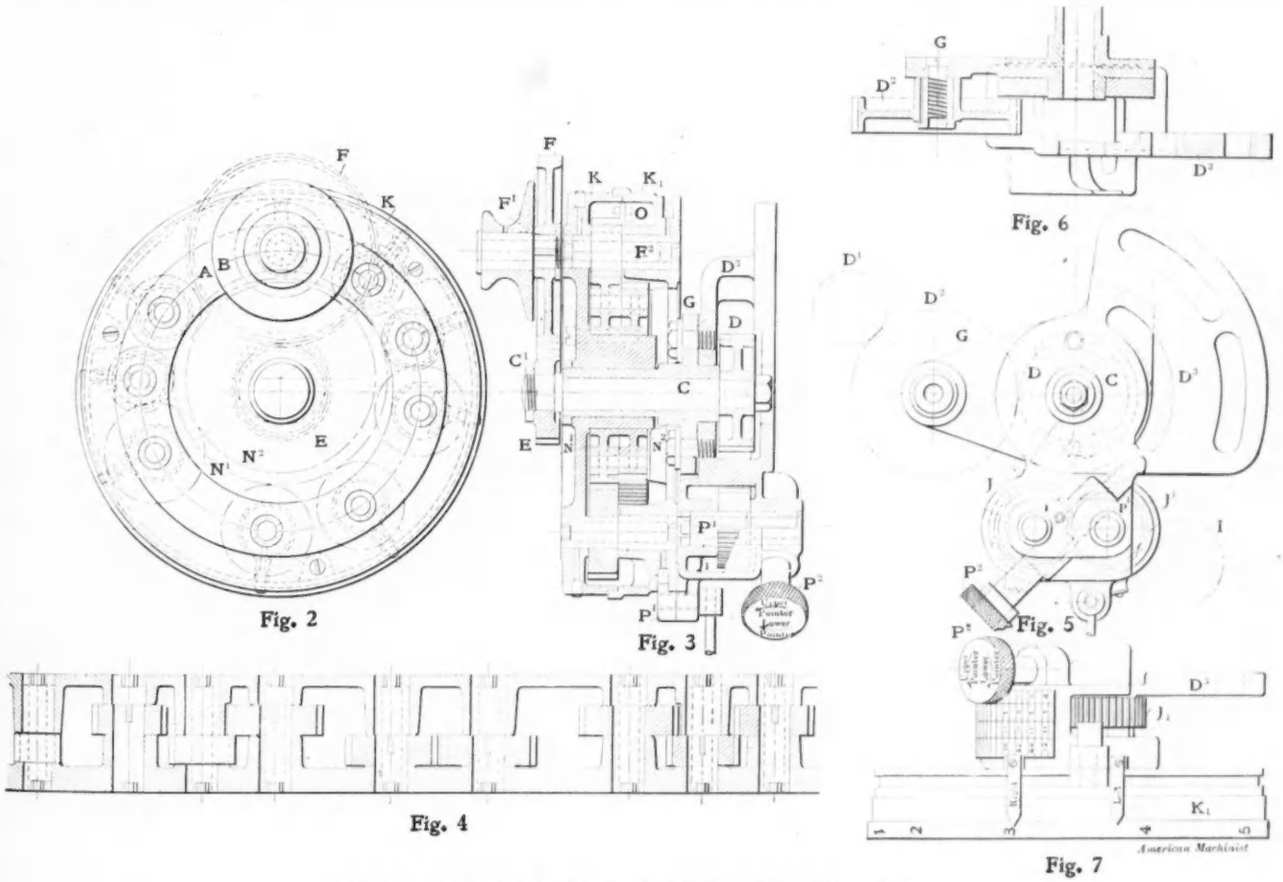


Fig. 2 Fig. 3 Fig. 6 Fig. 5 Fig. 4 Fig. 7

DETAILS OF NEW SCREW CUTTING AND FEEDING ATTACHMENT.

decreasing; in 1899 only 75,924 florins' worth was of British origin. France supplied 19,836 florins' worth, Switzerland 20,748 florins, Belgium 13,224, and a few tools came from Sweden.

Largely increasing were also the imports of brick machinery. The building activity throughout the country has kept the brick factories busy during the last few years, and many new works have sprung up. While in 1898 the imports of brick machinery amounted in value only to 560,340 florins, they rose to 822,330 florins in 1899. Here, again, Germany takes the lead, with 804,240 florins; but that we are able to compete in this line is shown by the fact that we occupied the second place in these imports, viz., 9,180 florins. The rest came from Great Britain (4,680 florins), Switzerland and Italy.

In flour mill machinery our share is very limited—2,268 florins out of a total importation of 550,368 florins. The bulk, with 494,208 florins, came from Germany. Swiss manufacturers seem to gain more ground in the flour mill machinery trade in Austria Hungary, they having contributed 53,892 florins' worth.

A large decrease, however, is noticeable in the paper machinery trade. While the imports in 1898 amounted in value to 734,204 florins, they fell down to 41,856 florins in 1899, which must be traced to the unfavorable state of affairs of the Austrian paper industry. Germany and Switzerland were the only suppliers in 1899.

Largely increasing, on the other hand, were the imports of electrical machinery, and in all probability this increase in the importation of foreign electrical machines and apparatus will assume still larger proportions in the future. The imports of electrical machinery rose from 1,092,690 florins in 1898 to 1,659,650 florins in 1899. Unfortunately, our share in this trade has, so far, been insignificant. We contributed but 23,940 florins' worth, while Germany's share amounted to 1,018,400 florins, followed next by Switzerland, with 591,280 florins. The rest came from Great Britain and Italy. In both parts of the dual empire electricity is making steady progress; great activity prevails especially in Bohemia, where a number of large electric enterprises are either under construction or contemplated.

Turbines are not included in the above given figures. Their imports amounted in value to 114,576 florins, as against 63,096 florins in 1898. The greater part (96,284 florins) came from Germany, 13,596 florins' worth from Switzerland, and the rest from Italy, Great Britain and Sweden.

A few words about bicycles and sewing machines. Though Austria possesses large bicycle factories (The Steyrische Waffenfabriks Akt. Ges. of Gratz being the largest one), yet the imports are considerable, they having amounted in 1889 to 1,084,500 florins. Here, too, Germany takes the lead, with 414,900 florins, while the United States took the second place with 348,300 florins. France was the third on the list with 100,800 florins, then came Great Britain, Belgium, Italy, Switzerland. The imports of sewing machines were valued at 2,998,100 florins, as compared with 2,560,950 in 1898, and 2,405,200 in 1897. Germany and Great Britain almost divide this trade between them, the former contributing 1,597,400 florins' worth in 1899, and the latter 1,228,850. Our share was only 147,000 florins.

In regard to small tools the same may be said as about machinery—Germany gets the lion's share and our contributions are very limited. To show this we will treat only a few items. Files and rasps are classified in two categories, viz.: (1) Of 25 centimeters and more: 203,184 florins, of which 145,728 florins from Germany, 18,432 florins from the United States; (2) of less than 25 centimeters: 541,260 florins, of which 426,800 florins from Germany, 40,740 florins from the United States. This makes a total importation of files and rasps of 572,528 florins, of which only 59,170 florins' worth came from this country.

Axes, plyers, nippers and screw stocks were imported to the value of 209,878 florins, of which 170,589 florins' worth from Germany and 14,544 from the United States. Of saws the total imports amounted to 911,000 florins, of which 841,750 were of German, and 7,500 of American origin. Of plane-cutters and chisels the figures are: Total imports, 92,162 florins, of which 75,719 came from Germany, and 1,827 from the United States.

Before concluding our remarks we would like to call special attention to the opportunities offered in the near future in Hungary for the sale of machinery.

Since the re-establishment of the Hungarian Constitution in 1867, the principle of proper co-operation in agricultural and industrial development, as far as the economic policy of the country is concerned, has been the guiding star of successive Hungarian statesmen, who have spared no efforts to encourage the founding of national industries in a country which but a few years ago was purely agricultural. Hungary has had to strive, and is still striving, in the direction of industrial development. The government, while recognizing the fact that industrial activity must primarily be the outcome of private initiative, has nevertheless from time to time framed the laws, the object of which has been to encourage industrial enterprise and to attract foreign capital.

Quite a number of factories were erected in 1899 with the assistance and co-operation of the Hungarian Ministry of Commerce, special encouragement having been given to the textile, chemical and iron industries.

Latest advices are to the effect that at the present time the Hungarian Ministry of Commerce is engaged in negotiations concerning the erection of twenty-eight large factories, comprising fourteen textile factories (which, if carried into effect, would represent a capital of 18,400,000 florins, and employ 1,200 to 1,500 mechanical looms and 5,000 workmen); six chemical factories (one wood-pulp factory, two india-rubber factories, one aluminum factory, one carbide factory and one lighting material factory), which, if carried into effect, would represent a capital of 5,000,000 to 6,000,000 florins and employ some 2,000 workmen; further, two coal briquette factories, one malt (export) factory and one shoe factory. These latter, if erected, would represent a capital of some 4,000,000 florins and would employ 3,000 workmen.

The negotiations in reference to the erection of the above cited factories, although well advanced, are not yet concluded. H. L. G.

A Storage Battery Spark Ignition.

BY HUGH DOLNAR.

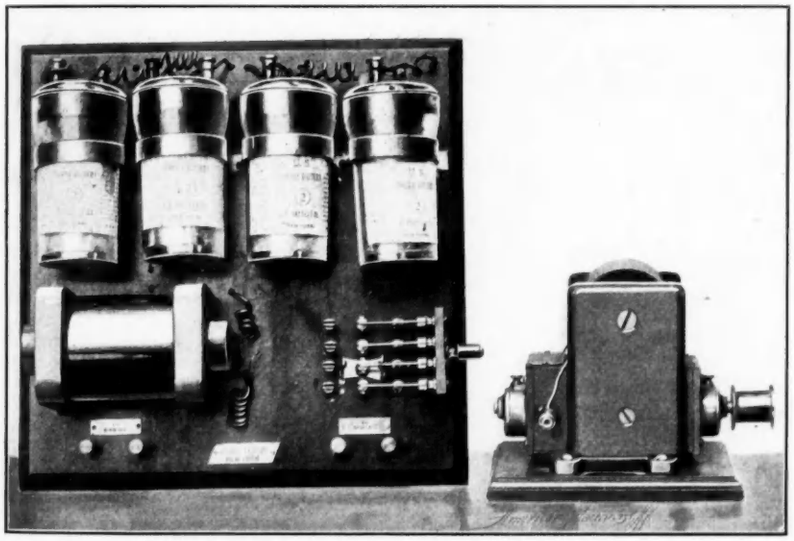
There can be no possible doubt that transportation on common roads by mechanically propelled wagons is the most important problem now before the mechanical world.

The choice of a motor for road-wagon use lies between electrical engines and heat engines. The heat motors are of two forms, the externally fired, which are almost or quite exclusively dependent on steam boilers and engines, and the internal combustion motors, which apply the fire directly to the cylinder and piston, and in their best forms are vastly more economical of fuel than the externally fired heat motors. The internal combustion motors are more simple than steam motors, weigh less, and use less fuel, and because of these advantages are more suitable for road wagon use than steam engines, if the internal combustion motors can be made as certain in action as the steam motors. The steam motor has the vast advantage of unlimited time for imparting the heat of its fire to the water in the boiler, and so rendering the heat available for motor driving. The boiler and fire grate may be any size, and the hot steam in the boiler may be retained for any length of time before using, thus giving a perfectly reliable reservoir of power to be drawn upon by the steam engine as the demands of driving the wagon require. With the internal combustion motor precisely the opposite of these favorable steam motor conditions obtains. Each working piston stroke of the internal combustion is an event by itself, having a beginning, a duration and an end, and before the beginning of this working stroke and after the end of it the motor is dead; its fire is out, and must be rekindled before the motor again becomes alive, or can make another stroke.

At first sight it would seem absolutely impossible that a heat motor should light its fire for every working stroke of its piston with sufficient quickness to produce

even a slow running movement by such means, and the first internally fired motors were constructed with what was known as the "flying piston," indirectly connected to the motor shaft, with a view to giving time for kindling the new fire, and so establishing pressure to drive the piston through a new working stroke. Now, however, internal combustion motors having their pistons directly connected to the crank shaft make from 500 to 2,000 turns of the crank shaft per minute, which means, in case of a single-cylinder motor, Otto cycle, that the fire must be lighted and the pressure established from 125 to 500 times per minute. Hence it becomes clearly evident that one of the prime requisites of successful internal combustion motor operation is an absolutely certain means for lighting the fire.

Up to the present time this problem of fire lighting in gas engines has not been answered with entire certainty and satisfaction, because the fire must not only be lighted, but must be lighted soon enough, and not too soon, if the best action is to be had; but the new devices herein mentioned give the possibility of producing an electric spark of great igniting power with such invariable constancy of action, and give this sure spark by means of an apparatus of such small weight and first cost, and such durability, as to seem to perfectly meet the highly exacting conditions of internal combustion motor charge ignition.



A STORAGE BATTERY IGNITER.

The ignition outfit, an illustration of which is herewith given, is adapted to the requirements of stationary motor use, and consists of two pairs of 5-ampere hours storage cells, mounted on a slate panel 14 inches square, together with a special low-current spark coil and double-throw four-point knife switch. Charging is effected by means of a small dynamo, specially designed for the purpose, weighing about 20 pounds, which is dust-proof, water-tight and self-oiling. It is belted to any convenient part of the engine.

The peculiar merits of this outfit lie primarily in the batteries themselves, they being strong, small in bulk and light. The size here used weighs, complete in heavy glass jars, just 2 pounds. This battery will deliver such an abnormally high current on dead short circuit that a spark coil is surely and fully charged on each connection, making a spark of greater volume and intensity than anything previously seen by the writer. The extraordinarily high voltage of 2½ volts per cell makes it possible to do the work with two cells, which requires six to eight cells of primary battery. These batteries, contrary to the usual practice with storage batteries, are sent out fully charged and with everything necessary to put them in active operation. While they may be put in service in thirty seconds, they will last in the condition in which they are shipped absolutely without deterioration until required for use.

The arrangement of the parts of this outfit, although of secondary value to the merits of the battery, is yet of very great importance, embodying several features of decided novelty.

Two of these cells, using the special low-current coil, have furnished perfect ignition for a single-cylinder, four-cycle, 10 horse-power stationary engine, with hammer contact and making 280 revolutions per minute, for 113 hours on one charge. On this basis, there being two pairs of cells, the outfit, using cells alone, is capable of furnishing ignition for upwards of twenty days' run of ten hours each, on one charge.

It is not intended, however, to draw on this surplus current, except in case of emergency. When the outfit is set up the dynamo is wired to terminals on the panel marked "Dynamo," and the terminals marked "Engine" are wired to the spark points. By throwing the switch to the right the operations of sparking from the left-hand pair of cells and charging in the right-hand pair of cells are started simultaneously. By throwing it to the left these processes are reversed. Connections are also provided by means of which the direction of the current through the spark points is reversed each time the switch is reversed.

By this simple and easily effected change of polarity, metal carried from one spark point to and deposited upon the other spark point while the current moves in one direction, is removed and carried back to its original location when the polarity is reversed by throwing the switch over. This arrangement, not before commonly known or used, adds greatly to both the durability and certainty of action of the spark points, and tends in a very marked manner toward the preservation of the adjustment of them as first made.

With the switch out, both processes of course instantly cease. By an automatic device of great simplicity, replacement of the switch in the same side from which it has been removed is surely prevented. Each pair of cells is therefore charged and used alternately, so that the engine is always running on freshly charged cells. As a fully charged pair of cells registers 3-10 volt higher than the normal 5 volts, they are strongest when strength is most needed, namely, on starting the engine when the cylinder charge and cylinder are cold. The great merits of this arrangement will readily be appreciated by those who have used primary cells for this important work, because primary batteries, constantly growing weaker, finally die out, leaving the engine useless at what is always an inconvenient, and often dangerous, time. For road wagon use, this outfit may be boxed for the sake of lightness, or the box may be omitted altogether, the parts carried thereby being otherwise supported, as the construction and location of the wagon driving parts may render most convenient.

This ignition outfit first came under my notice at the Secor kerosene motor shops, where a thorough, exhaustive and long-continued series of tests of various charge-igniting devices has been made. These spark trials, which included the use of all commonly known forms of spark plug, batteries, coils and dynamos, finally resulted very favorably to the spark outfit here shown, as being lighter, cheaper and more certain in action, and demanding less skill and watchfulness on the part of the user than anything else employed.

The precise arrangement of spark-producing points finally adopted by the Secor Company employs pieces of platinum-iridium alloy wire, 90 per cent. platinum and 10 per cent. iridium, 3-32 inch diameter and ¼ inch long as spark points. These bits of wire are silver-soldered into the threaded ends of small steel screws, about ¼ or 5-16 inch diameter, so as to

leave ⅛ inch in length of the wire projecting beyond the ends of the screws. As the platinum-iridium alloy melts at 1,200 degrees, there is no difficulty whatever in soldering the wires into the steel screw ends with ordinary jeweler's silver solder, using borax as a flux. This is a simple, neat and convenient method of mounting the spark points, as the screws are very small, and a new point can be inserted in an instant by simply removing the old screw from the spark arm and replacing it with a new one. The "hammer" contact is employed to produce the spark, the wire points being normally separated 1-16 inch by a spring effect. When the spark is to be produced the points are first brought into certain contact by a cam acting on the rocker arm of the movable point carrying rock shaft; this cam acting on the rocker arm through a spring connection stiffer than the spring which normally holds the points away from each other, and the cam has an over lift which is taken by the interposed spring, so as to ensure a perfect point contact through a considerable range of spark-point length variation. As soon as the cam has established a point contact the cam lever is dropped, through the action of the point separating spring, and the spark is made. I saw one of the Secor spark plugs which had been in use for several weeks, removed from the cylinder head. The whole of the internal parts, the plug end, rocker arm and so on, were evenly coated with a very thin deposit of fine, bluish-black soot, not adhesive, readily wiped off by finger application, except the contact faces on the ends of the wires, which were perfectly flat and shone like bright silver.

The Secor ignition trials included a long use of the jump spark with primary batteries and Rhumkorff coil, as well as other forms of rocker-carried contact points.

The entire weight of the outfit as shown is about 45 pounds. The life of the dynamo is very long. The platinum-iridium points last for six or eight months, when used as described with change of polarity, and the action of the whole spark-producing mechanism is continuous, requiring no additions, except that of distilled water to the battery cells occasionally, and the replacement of the spark points at widely separated periods of time. The cost of the platinum-iridium wire is the same as that of gold, $1 per pennyweight, making each spark point 3-32 inch diameter by ¼ inch long cost something like 75 cents.

I give this extended and minutely detailed description because I know it has great interest for every constructor and user of internal combustion motors. I shall soon be able to report personal experience in the use of this spark outfit, as I am now applying it to my own six-cylinder road-wagon motor. It is made by the United States Storage Battery Company, 253 Broadway, New York.

Abbreviations for Metric Units.

In an appendix to a paper by M. Edouard Sauvage, on "Recent Locomotive Practice in France," read before the British Institution of Mechanical Engineers, of which he is a member, is given a table of abbreviations for the metric units. These abbreviations were arranged by the International Committee of Weights and Measures, at a meeting held October 2, 1879, and are extensively used in the official publications of several countries, in a large number of periodicals and books and in the proceedings of many societies. They are simple, symmetrical, and avoid the ambiguity of such abbreviations as *kil.*, which may denote kilometers or kilogrammes. The table is printed herewith.

Length		Surface.		Volume.		Capacity.		Weight.	
								Tonne,	t.
Kilomètre,	km.	Square kilomètre,	km^2.	Cubic mètre,	m^3.	Hectolitre,	hl.	Quintal mètrique,	q.
Mètre,	m.	Hectare,	ha.	Stère,	s.	Décalitre,	dal.	Kilogramme,	kg.
Décimètre,	dm.	Are,	a.	Cubic décimétre,	dm^3.	Litre,	l.	Gramme,	g.
Centimètre,	cm.	Square mètre,	m^2.	Cubic centimètre,	cm^3.	Décilitre,	dl.	Dècigramme,	dg.
Millimètre,	mm.	Square décimètre,	dm^2.	Cubic millimètre,	mm^3.	Centilitre,	cl.	Centigramme,	cg.
Micron,	μ.	Square centimètre,	cm^2.			Millilitre,	ml.	Milligramme,	mg.
		Square millimètre,	mm^2.			Microlitre,	λ.	Microgramme,	γ.

ABBREVIATIONS OF METRIC UNITS, AS ADOPTED BY THE INTERNATIONAL COMMITTEE OF WEIGHTS AND MEASURES.

The Editor's Strenuous Labors.

We beg to call the attention of our American contemporary, "Modern Machinery," printed in Chicago, to its wholesale appropriations of matter, specially prepared for our columns, without any acknowledgment. We have no objection to the information which we give in our columns being quoted, but we do think, when used by other contemporaries, proper acknowledgment should be made. As a rule, our American contemporaries do this; but "Modern Machinery," in its efforts to appear original, furnishes a striking exception to the standards of honor usually observed in this direction. In its July issue we notice no less than six articles in which information and sketches have been abstracted from our columns; but not in a single instance is a word of credit given to us, while this is by no means an isolated instance. We make this brief reference to the matter in the hope that our contemporary will take the hint and mend its manners.—"The Mechanical Engineer," of Manchester.

A Twenty-five Ton Hydraulic Traveling Crane.

We present herewith drawings of a 25-ton hydraulic traveling crane designed by Mr. Ernest W. Naylor, built by the Pennsylvania Iron Works Company and recently put in operation in the Altoona shops of the Pennsylvania Railroad. The crane was installed for handling the work for what is believed to be the largest hydraulic gap riveter ever built, which also was designed by Mr. Naylor, and which we will be able to show in a succeeding issue.

The crane embodies many novel and interesting features. The lift of the crane is 50 feet, the cross or trolley traverse 13½ feet, and the bridge traverse 50 feet. The lifting and bridge traverse are by means of hydraulic motors or engines, and the trolley traverse by means of cylinders, the trolley passing beneath them. The use of hydraulic cylinders for hoisting is common enough, but the use of hydraulic motors or engines for hoisting and traversing is rare. In this case there were many reasons for using the motors instead of direct-acting cylinders. The chain on a direct cylinder has to be strong enough for the load on the ram, and when 50 feet of lift is required a cylinder and ram would be out of the question on account of the length and chain required. On account of the heavy chain also, some 75 or 80 per cent. would have to be allowed for friction alone. There is much less friction in the motor method of operating, and it practically all occurs before it gets to the chain, hence a size of chain suitable to the load alone may be used. The most important consideration, however, is in the securing of minute and precise movements of the load as required. If a ram and cylinder were used the multiple would be at least 8 to 1, and it would take a highly skilled man to raise or lower a load 1-32 inch, as the movement of the ram would, of course, be only one-eighth of this, or 1-256 inch. With the motor it is found an easy thing to command movements of 1-32 inch, and these are necessary in boiler work. With the motors it is possible to reverse instantly, and there is no jar or shock, as the valves are arranged to take care of any possible water-hammer. All of the movements of the crane are controlled by the man who runs the riveter, the valves being all placed be-

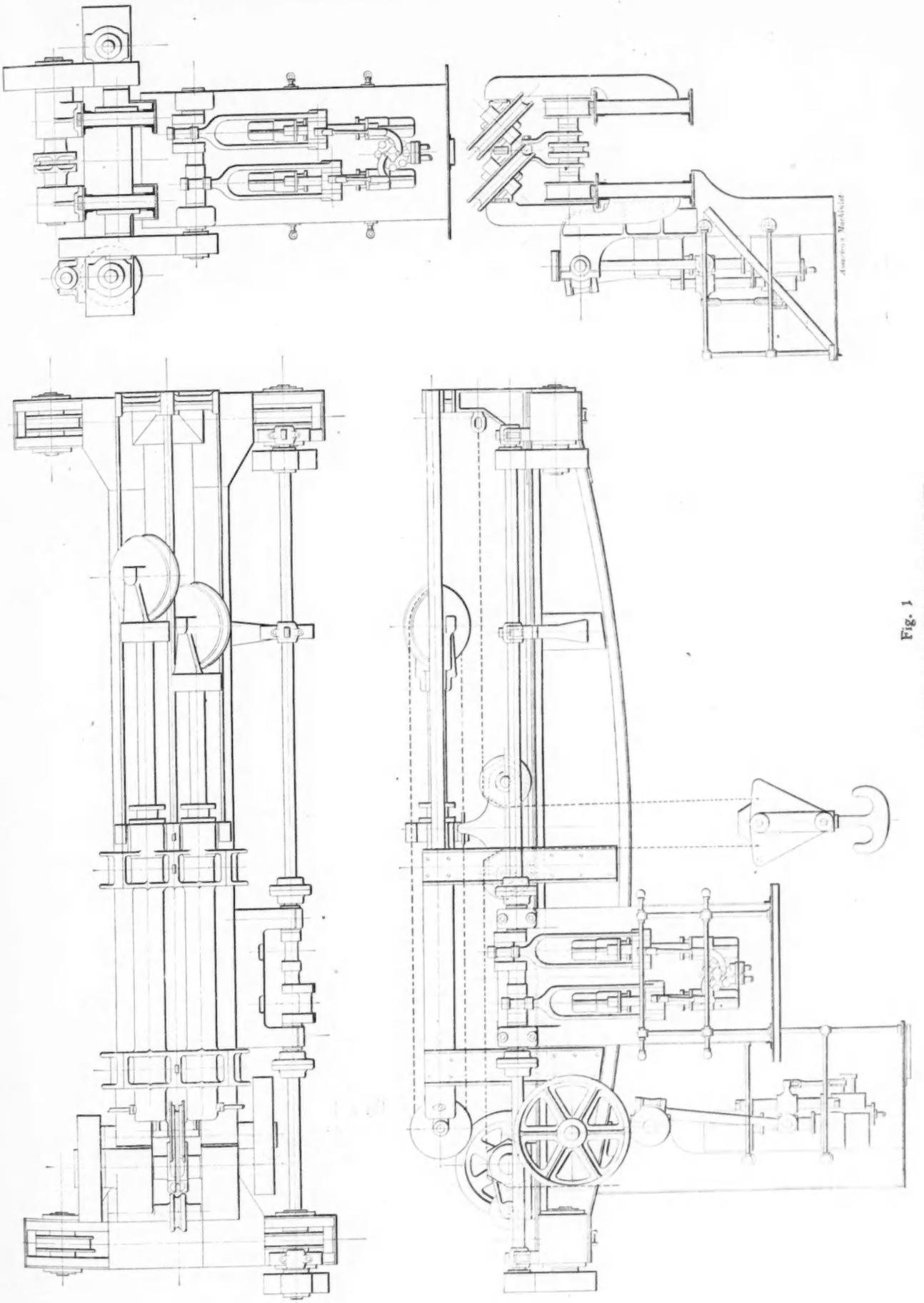


Fig. 1
A 25-TON HYDRAULIC TRAVELING CRANE.

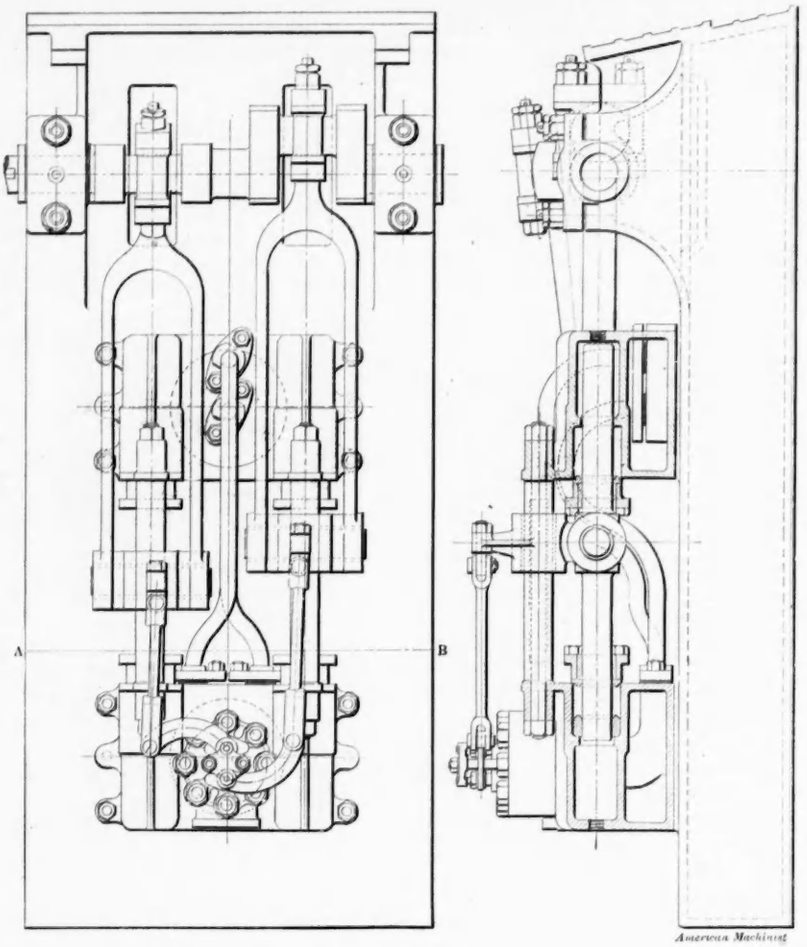


Fig. 2

HYDRAULIC MOTOR FOR TRAVELING CRANE.

hind the back of the riveter and easy of access.

The water, under the necessary operating pressure, is conveyed to the mains on the crane through balanced knuckle-joint pipes which are carried on light rails hung from the roof trusses, and the discharged water is returned by the same means, the reversing of the motors being accomplished by simply reversing the flow of the water, or, in other words, the controlling valve at the riveter changes pressure to exhaust and *vice versa*.

The hoisting chain passes from one end of the bridge over one sheave in the trolley, around one sheave in the block, over the second sheave in the trolley and across over a pitch wheel into a receiving box at the back of the hoisting motor. All the sheaves are hexagonal, so that the chain lies flat, thus avoiding the bending of the links or otherwise straining or putting the chain out of pitch. The block hook is of ram's horn design, and turns on ball bearings. All the gears are of steel castings and machine cut. Two similar cranes, but of only about one-half the capacity, have been in use in the same shops for two years, and have proved highly efficient with only the slightest repairs.

Fig. 1 shows the entire crane in plan and elevation, with the arrangement of motors and gearing. Fig. 2 shows the construction of one of the motors, and Fig. 3 shows the reversing or operating valves for the motor. Each motor has two pairs of single-acting plungers, each 3½ inches in diameter and 8 inches stroke. The two plungers of each pair face in opposite directions, and a forked connecting rod attaches to an enlarged central portion between them. The cranks are at 90 degrees, so that there are no dead centers. As seen in Fig. 3, there are two sliding valves to each motor. Each valve is moved by a spindle with an eccentric pin upon the end which works in a sliding block on the back of the valve. The spindle is moved by a lever upon its outer end and a connection to the crosshead or central portion of the plungers. As the valves have no lap, the operative pressure follows the plunger for the whole stroke, while the discharge for the opposite plunger is correspondingly open.

We are in receipt of a book of wash drawings illustrative of the natural and artificial attractions of "Vandergrift; Its Homes and Industries." Among the latter are the works of the American Sheet Steel Company, the Chilled Roll Foundry and the Vandergrift Lumber Company. This brochure is designed and published for the Vandergrift Land & Improvement Company. It has cost something and makes a pretty showing. But where is this charming Vandergrift situated? We are sure we don't know, except that it is somewhere beside "the picturesque Kiskiminitas River," wherever that may be.

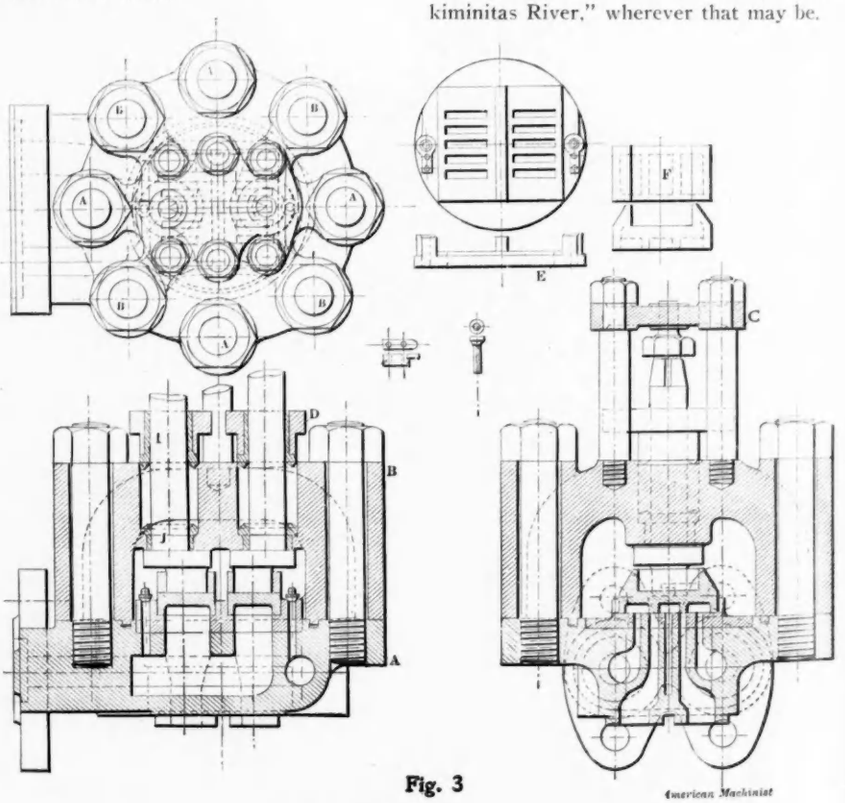


Fig. 3

OPERATING VALVES FOR HYDRAULIC MOTOR.

Patents: What They are Not.*

BY PAUL SYNNESTVEDT.

It is not the purpose of this paper to present a lengthy treatise on patents, from a strictly legal standpoint, but rather to try and give to the members of the Western Railway Club a little instruction from the standpoint of a railway man, which the writer, from almost constant association with railway men and railway work, still feels himself to be, although for some years past his more immediate occupation has been the practice of patent law.

But few of our busy railroad men have had oportunity or occasion to apply their minds to studying the subject of patents, and it necessarily follows that but a very small proportion have any proper conception as to the nature of a patent right; or, to put it differently, what a patent is; or, more accurately still, perhaps, what it is *not*, what relation one patent bears to another, and whence arise so many apparently anomalous situations as are encountered under our patent law.

Most men who are blessed with at least ordinarily astute minds naturally suppose that when an inventor takes out a patent he gets thereby a right to proceed unmolested with the manufacture, sale and use of his invention. That is not the case, however, as we shall see from a little investigation.

The origin of the erroneous idea above stated may, perhaps, be traced to the language employed in the patent grant itself, and in the constitutional clause which is really the basis of the patent system.

It was provided in the Constitution that Congress should have the power "to promote the progress of science and useful arts, by securing for limited times to authors and inventors the exclusive right to their respective writings and discoveries." Under this provision of the Constitution, laws were passed providing for the grant of patents. The foundation upon which such laws are built involves the idea of a contract between the inventor and the public. In exchange for a full and complete disclosure of the invention, to be preserved in the public records, and accessible at all times to the public, the government agreed to undertake to secure to the inventor the *exclusive* right to his invention for a term of years. From the beginning, the language employed in the patent itself followed the wording of the above constitutional clause. Notice, for example, the *facsimile* copy reproduced on page 173,† signed by George Washington and countersigned by Thomas Jefferson, which is taken from what is said to be the first patent ever issued by the United States. It was granted January 31, 1791, to Francis Bailey, of Philadelphia, and related (to quote the patent itself) to certain "Methods, not before known or used, for forming punches, by which to impress on the Matrices of Printing Types, whether such Types be for Letters or Devices, as well as to impress on any Metal or other substance capable of receiving and retaining impressions, various Marks which are difficult to be counterfeited."

The grant recites that "the said Invention appears to be useful and important," and that "in pursuance of the Act entitled 'An Act to promote the progress of useful Arts,'" there is granted "to the said Francis Bailey, his Heirs, Administrators and Assigns, for the Term of fourteen years, the sole and exclusive Right and Liberty of using and vending to others the said Improvement, according to the true Intent and Meaning of the Act aforesaid."

The essential features of the grant have not really been changed since the foundation of the patent system, over one hundred years ago.

On another page will be found reproduced a *facsimile* copy of the grant of a patent recently issued to Mr. John W. Cloud, lately of Chicago, Ill., on a car truck. Examination of the terms of this modern grant will show that it does not differ materially in substance from the early one, except perhaps in the recital of the several steps taken by the inventor to procure the patent. It will be noticed that this grant also purports to convey "the exclusive right to make, use and vend said invention throughout the United States and the Territories thereof."

As a matter of fact, neither of the above grants give the inventor the right to make, sell, or use his own invention, but only the right *to prohibit or prevent others* from making, using or selling his invention for a definite number of years, for the infringement of which right he may, under the law, recover damages or profits from the infringer.

That by the grant of a patent the government does *not* give the inventor the right to make, sell or use his own invention, is evident from the fact that prior to such grant *he already has such right*, provided there are no patents to earlier inventors which he infringes; and in case such other patents or conflicting rights exist, the mere issue of a patent to him will not relieve from the charge of infringement any attempt to make, use or sell his patented device, whether such attempt be made by him or anyone else.

It is the word "exclusive" that really gives character to the grant—the right to *exclude* or *prohibit* others from doing something. Whether a patentee has a right to operate under his own patent or not is entirely dependent upon the existence or non-existence of prior claims held by others, which would be infringed by such operation; and this is a question entirely different from the question as to whether this particular patentee's rights are valid, or infringed by later inventors.

What has been said concerning the nature of the patent grant will, perhaps, help to explain what so many have difficulty in understanding, *i. e.*, how it can be possible for more than one to hold what appears to be a valid patent upon substantially the same thing. As a matter of fact, that is *not* possible; it is only an appearance. The difficulty generally arises in a case where one man holds what is known in patent law as a *broad* or *generic* patent upon a certain invention which has been improved upon by others in various ways, the others securing patents upon their several *improvements*. The man who holds a broad or generic patent has a right to prohibit its use by everyone else, so long as his grant continues alive; but he has *not* the right to prevent or prohibit others from exercising their inventive faculties in the development of *improvements* upon his invention, nor has he the right to prevent or interfere with others securing patents upon such improvements. That would not "promote" the progress of science and the useful arts, but manifestly *retard* it. As has been well stated by the United States Supreme Court, the disclosure of a broad, generic or pioneer invention not only does not stop or check development along the same line, but rather serves to stimulate it.

To illustrate the distinction between what is known as a generic and what is known as a specific patent, and the rights of the parties holding the same, let us take, as an example, the case of a car coupler. Suppose A invents an improved vertical plane coupler or drawbar, comprising, essentially, three parts, a *head*, a *knuckle* and a *locking pin*. Suppose he is the first who has ever employed such three parts in combination in a coupler. He is entitled to and can procure a patent upon the combination between a head, a knuckle and a locking pin, his claim being entitled to the broadest interpretation by the courts.

Suppose B now takes a coupler made in accordance with A's invention, and, in using the same or studying upon it, works out a different form or arrangement of the locking pin and knuckle. B is entitled to procure, on the filing of proper papers, a patent on his invention, claiming his specific or particular improvement on A's generic invention. The existence of A's patent has not had, and obviously should not have, any effect at all in preventing B from securing a perfectly valid patent on the specific improvement which he has invented; for a patent, be it remembered, does not grant the right to *make* or *use* an invention, but only the right to prevent others from doing so. The government has given B a patent on his specific improvement, although it is to be remembered that there has been a prior generic patent issued to A, broadly covering all couplers employing a combination of a head, a knuckle and a locking pin. B's patent, therefore, does not give him the right to make or use his own inven-

*A paper recently read before the Western Railway Club.

†Illustrations not essential and omitted here.—Ed.

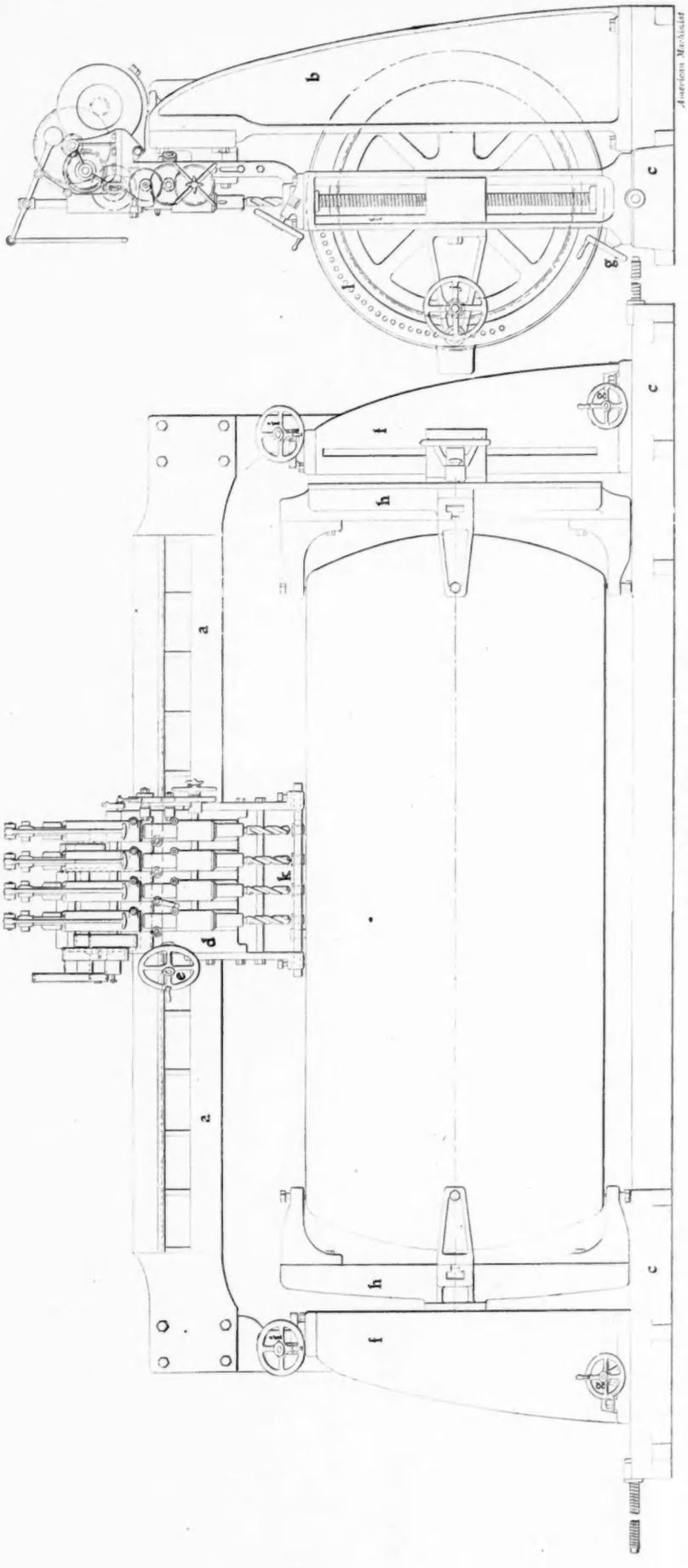
tion, because his invention cannot be made or used, except in making or using the invention which is already patented by A. Obviously, if this were not so, the value of A's broad patent would be destroyed as soon as anyone patented an improvement upon it.

The enforcement of such a rule would practically upset the whole patent system, since nearly every invention is or may be broad or generic to others, in the same line, which follow after.

What the government does give to B is simply the right to *prohibit anyone else* from using that which he originated, or his particular contribution to the art, which in this case was a specific improvement upon the locking pin or knuckle of A's coupler. A, until his patent expires, can, if he chooses, entirely prevent B from putting his invention in practice, for the reason that B's invention is of such a nature that it cannot be used except in conjunction with the invention made by A. In the words of the patent practitioner, it is but one specific form of a generic structure, of which A holds the monopoly.

On the other hand, while A is entitled to prevent B, as well as everyone else, from making or selling any couplers embodying the broad or generic invention on which A holds a patent, B, by virtue of his patent and rights thereunder, can entirely prevent A from appropriating or making any use of his specific or improved form of knuckle or locking pin. If A wants to incorporate B's improvement in his coupler, he must get the consent of B by license or purchase. In the absence of such consent, he is confined to the use of his generic form of coupler, without B's improvements.

The above illustration may serve to make plainer the peculiar nature of a patent grant, already explained; *i. e.,* that it is not a grant by the government of the right to make, use or sell a man's invention, but merely a grant of the right to prevent or prohibit others from making, using or selling it unless they pay tribute to the patentee. It is largely because of this distinction that it is possible for so many perplexing cases to arise in which it appears to the uninitiated as if a man, having procured a patent, has in some way been unjustly treated, because he finds, when he attempts to exploit his invention in practical work, some other patent previously granted stands in his way. It is incumbent upon patentees, as well as those contemplating purchases, manufacture, or other dealing involving patent rights, to find out just what relation the patent in controversy bears to others in the art, and guide their actions accordingly. The mere issue of a patent to an inventor, by the government, shows nothing more than the *prima facie* ownership, vested in the grantee, of a right to prevent others from making, using or selling the particular invention or specific improvement defined in the claims, and indicates nothing at all



A BOILER SHELL DRILLING MACHINE.

as to the existence or non-existence of any prior rights in others which may be infringed by commercial working under the patent. That can only be ascertained by personal investigation or search by an attorney. It is said the patent shows only *prima facie* ownership, because all patents are subject to be defeated in case proper defense can be brought against them in the courts.

A Boiler Shell Multiple Drilling Machine.

This machine was originally designed for drilling Thornycroft boiler drums, and as will be seen in the accompanying line engraving, consists of a crossrail *a a*, supported at the ends by two uprights *b b* standing on sub-bases *c c*, which are held together by two channel bars.

The crosshead carries a carriage *d*, having a horizontal movement operated by a hand wheel *e* and gear working in a rack on the crossrail. The front of the carriage is planed with T-slots to receive the tongues in four drilling heads, allowing the latter to be moved horizontally so as to adjust the distance between the holes to be drilled. The drilling heads are driven by an electric motor placed at the back of the carriage and connected to the spindles through a chain of gearing so arranged that by the grouping of this gearing four main changes of drill speeds can be obtained, and by the use of the starting and controlling switch furnished with the motor and having five steps, four intermediate speeds can be obtained in each group, making twenty spindle speeds in all.

The carriage is furnished with an automatic down feed and quick hand return, so that any of the spindles, in groups or singly, can be fed down automatically or quickly returned by hand, and each spindle can also be quickly disengaged from the multiple feed and by the use of a hand lever connected with the spindle counterbalance can be quickly adjusted for different lengths of drills, or with this lever feed be used for countersinking.

The boiler shell or drum is held by two center heads *f f* mounted upon the front part of the sub-bases, which are grooved lengthwise of the machine to fit the tongue in center heads. These are easily adjusted horizontally by means of a screw operated by hand wheels *g g* to suit different lengths of shells. The centers carry chucks *h h* at each end, in which the boiler shell is clamped, and the centers are adjusted vertically by means of a hand wheel *i i*, gearing and screw. By revolving the boiler shell on the centers, which is done by means of an internal gear on one of the chucks and a pinion and hand wheel *j*, carried by a pinion bracket on the center heads, different lines of holes can be reached, and by moving the carriage on the crossrail the machine can be adjusted for different holes in each line.

In spacing the holes in the lines the carriage is furnished with an adjusting jig *k*, carrying four bushings, and by means of a fifth hole correctly spaced in this jig a pin can be dropped in the last hole drilled so as to bring the carriage into position for the next four holes. In spacing the holes on the circumferential seams an index plate *l*, which is drilled with holes properly spaced for the lines of holes in each shell, is bolted to the chuck containing the operating gear, and a pin held by the pinion bracket drops into the holes successively, thus positively locating the holes in each line. For making these circular templates a small motor is furnished, which can be geared to the pinion rotating the chuck, and a small tool post and slide is fastened to the pinion bracket so that the templates can be turned off in place, after which a line can be struck at the center of the holes by placing a scriber in place of the locking pin, when the centers of the holes for each particular shell can be laid off. The small motor is also adapted for drilling these holes, so that the whole index plate can be finished in place on the chuck.

The machine is furnished with an automatic lubricating arangement operated by a pump, which keeps a steady flow of oil on the work.

The capacity of the machine is four 1½-inch holes at one time. Spindle feed, 10 inches. Twenty spindle speeds, ranging from 14 to 120 revolutions per minute, are provided. The automatic spindle feed varies from .004 to .04 inch advance per revolution of spindle. Distance between spindle centers, from 4 to 8 inches when spaced equally, or 24 inches extreme distance between outside spindle centers. Shells from 15 inches in diameter by 6 feet long to 60 inches in diameter by 12 feet long may be handled, two sets of chucks being provided for obtaining this range. The machine is the product of Thos. H. Dallett & Co., of Philadelphia.

Letters from Practical Men

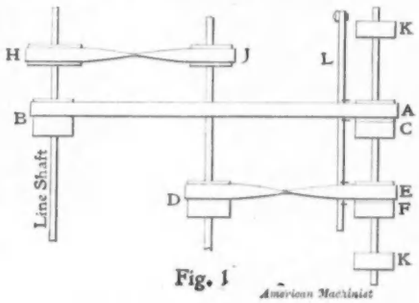
Speeding up a Planer.

Editor American Machinist:

This Fig. 1 that I have here is an interesting thing to me, and some of the other fellows may like to see it. I cut it out of a trade paper lately, and it's a good sample of technical wool-gathering. It seems that a representative of the journal aforesaid was prowling around in search of technical scoops, and he saw this thing and sent it in. Maybe his attention was called to it, and maybe he discovered it himself. Either way it is equally to be prized.

In a certain shop they had a planer, and the planer had been running along, or perhaps, rather, sauntering along in the good, old-fashioned way, having but one speed for every kind of metal and for every thickness of cut, when at last somebody had caught on to the modern idea of making the movement fit the work, or, in fact, of speeding up a machine in cases where there was no surviving objection to so doing.

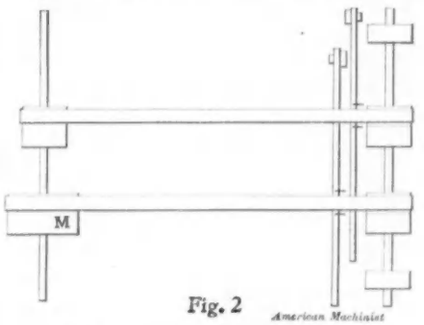
The sketch, Fig. 1, shows how, as it is alleged, they speeded up the planer. As things were originally, the shaft at the left was the line shaft, and the shaft at the right was the countershaft for the planer. On the two pulleys *K K* on the ends of the countershaft were the belts that went down to the two sides of the planer, one belt for the cutting stroke and the other belt for the backing stroke. Then there



HOW THE PLANER WAS SPEEDED UP.

were the wide-faced driving pulley *B* on the line shaft and also the tight and loose pulleys *A* and *C* on the countershaft, *A* being the loose pulley. A shipper which shipped the belt from the loose pulley to the tight pulley, and *vice versa*, with of course the belt to be shipped, completed the arrangement.

When they determined to have another and a faster speed for the planer, they made the change entirely by addition, and not at all by subtraction or substitution. Some inventors have adopted the latter methods, but not so in this case. Every-



HOW IT MIGHT HAVE BEEN DONE.

thing for the normal or slow speed of the planer was left as it was. They put on the line shaft a pulley *H*, considerably larger in diameter than pulley *B*, so as to give the increased speed required. They also put up an intermediate countershaft with pulleys *D* and *J* on it, both of the same diameter, and they also put on the old countershaft the tight and loose pulleys *E* and *F* opposite *D*, *E* being the tight pulley and *F* the loose. Then there were the belts from *H* to *J* and from *D* to *E F*, and as the belts were so short it was found best to cross them, or perhaps it made the

arrangement look more ingenious and more attractive to the technical wool-gatherer. Two additional pegs were put into the shipper, for shipping the new belt on pulleys *E* and *F*, and then everything was comp'ete. As things are shown in the sketch, the planer is running on the increased speed and making money. A movement of the shipper and belts toward us would change the drive to the old, easy-going gait, and *vice versa*. While the belt was in transit there might be some little quarreling between the belts as to which should do the driving, but that would soon be settled. A more important feature of the arrangement is that the planer would have to run all the time any way. There could not possibly be any more lost time for it, as it would not be possible to get both the belts on the loose pulleys at the same time. Changing the work on the platen could be done at night, or, if done in the daytime, the engine could be stopped, and then all hands could help.

If it had ever come to me to speed up that planer I am afraid that I should not have known any better than to have done it as in Fig. 2. I would have put the pulley *M*, with the wide face and the increased diameter, on the line shaft, and the pair of tight and loose pulleys on the countershaft, and then the one new belt and a second independent shipper would be all that would be needed to complete the job. The precise location and arrangement of the shippers would be determined by the circumstances of the case. This, I am afraid, would not have been sufficiently ingenious to attract the technical wool-gatherer, and I would not have seen my device ingenuously described in the trade journal. But it would have done in all particulars just what I intended it to do. It's a great thing when you can get your devices to do as much as that for you.

TECUMSEH SWIFT.

Straightening Hardened Steel.

Editor American Machinist:

To straighten pieces warped in hardening—say, a punch too crooked for finishing on the grinder—place it on two V-blocks on the bed of a straightening press with the concave side down. Then take an alcohol or naphtha lamp and heat up the under side, but not enough to draw the temper, and while hot apply the pressure according to your judgment to spring the punch back. A little practice will enable one to save many a piece by this means.

JOHN L. COOK.

Bridgeport, Conn.

Making an Anvil Block with Dry Sand Cores.

Editor American Machinist:

Here's a little one that came along the other day. It was an order for an anvil block, a 36-inch cube of solid cast iron, and as far as the pattern shop was concerned it was disposed of with neatness and dispatch. One core box with two fillers, like sketch Fig. 1, did the trick.

Fig. 2 shows what the cores made in this box looked like, and how they went together. They were squared up from the level bed of a pit in the foundry floor. This pit was dug about the same depth as the cores, and somewhat wider and larger. Green sand was rammed in between the outside of these cores and the sides of the pit. A couple of covering cores were stopped out of the same core box and used in lieu of a cope.

HOBO.

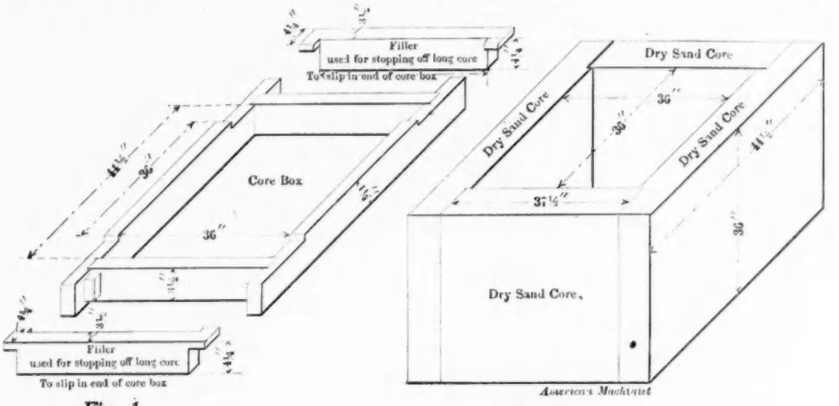


Fig. 1 Fig. 2

CORE BOX AND MOLD FOR ANVIL BLOCK.

An Engine Bed Pattern.

Editor American Machinist:

As a change from the "Simple Pattern" which our friend "Hobo" has correctly solved from his wide experience and intimate acquaintance with economic conditions, I venture to present a piece of work which calls for some additional exercise of the gray matter which good pattern-makers are supposed to possess. The job was done in the shop of the Dayton Pattern and Model Works, of Dayton, Ohio, and is of interest from the fact that it was so arranged as to enable the engine builders to make twelve different engine frames, varying in stroke from 36 to 72 inches, from the one pattern, and also to make either a right or left-hand engine of either of the different strokes.

As arranged for the 72-inch stroke engine the extreme length of the frame pattern was over 27 feet, while the width across the arms connecting the pillow block with the crosshead slides was about 6 feet. The job consumed about 3,300 feet of lumber, 8 gallons of shellac and about 15 gross of heavy screws, very few nails being used. The weight of patterns and core boxes complete was in the neighborhood of 2 tons.

The accompanying drawing explains the general construction of the patterns and the method adopted for shortening the pattern for different stroke engines. One half core box was used for the crosshead slide housing, arranged to reverse for the two lengths of opening in sides, and to shorten up by moving an internal flange at the cylinder end and removing loose

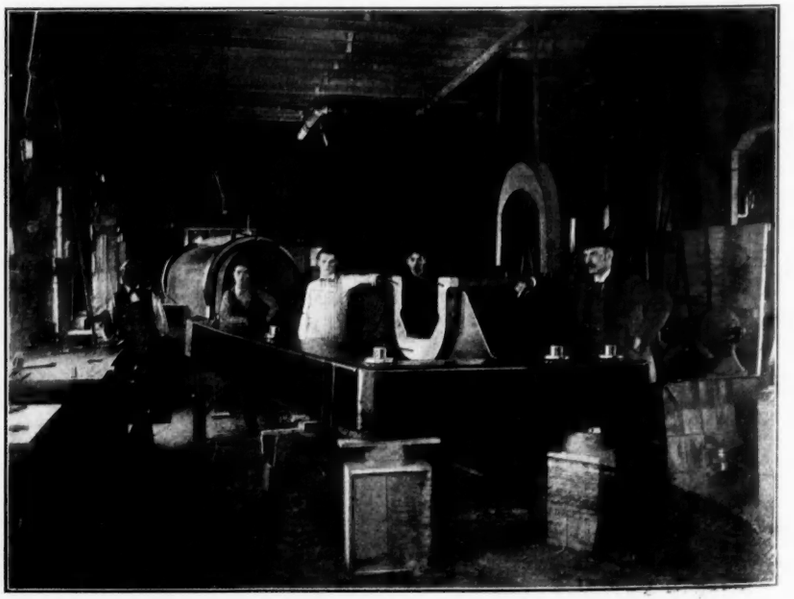


FIG. I. AN ADAPTABLE PATTERN FOR AN ENGINE BED.

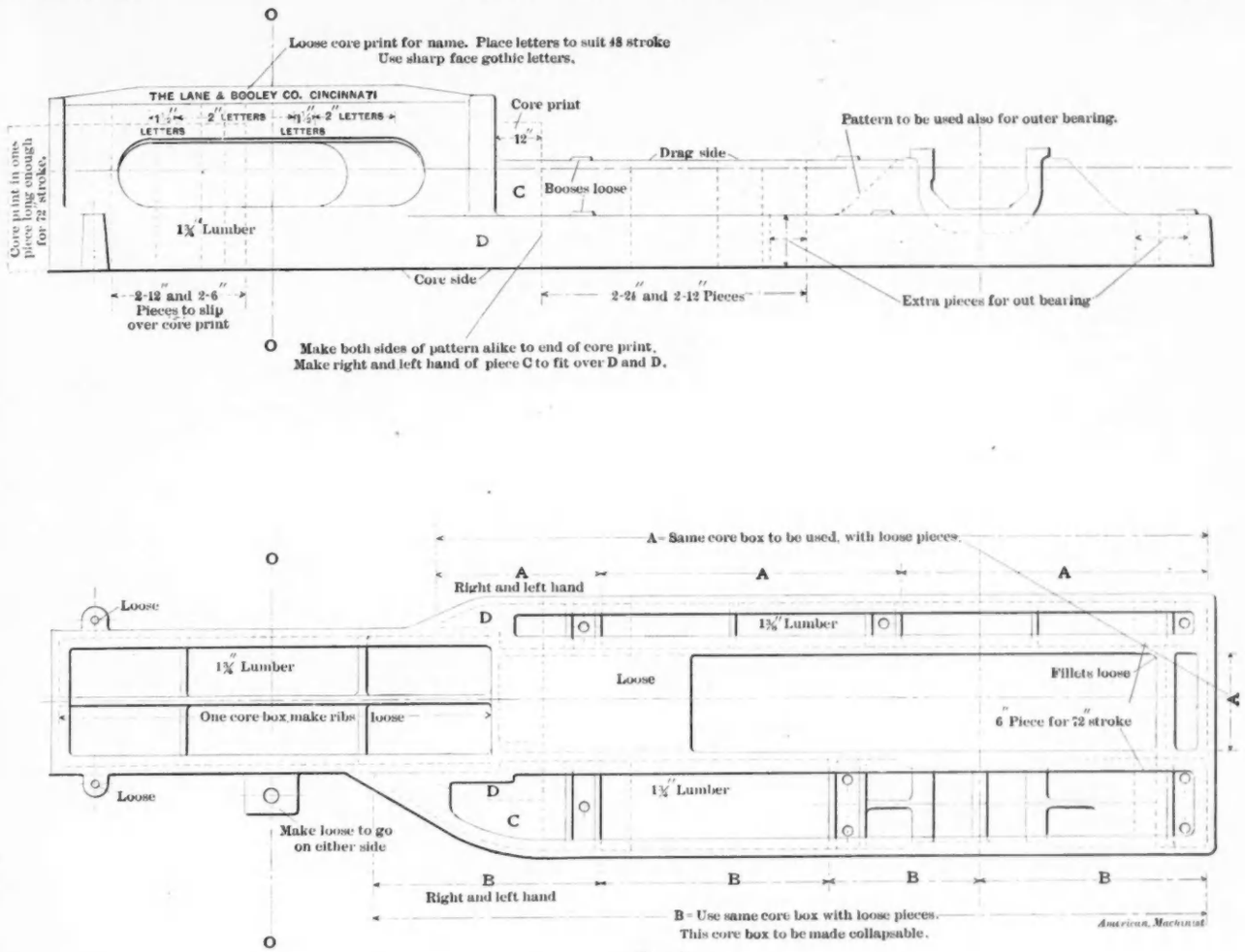


Fig. 2

DRAWING FOR PATTERNMAKER FOR LARGE, ADAPTABLE PATTERN FOR ENGINE BEDPLATE.

sections of metal in the box proper, which was worked straight through the size of the end core prints. As the end prints were carried to the bottom of the bed in the form of a tail print a filling-in core was necessary, which is moved up on the main core at any point when the pattern is shortened up. The core underneath the crosshead slides was made in a box having only side and ends, the upper curved outline being swept out. This core is hung in the cope. The core boxes for the ends of the square frame portions, or pipes, as they are termed, were made to reverse for right or left engine by means of loose pieces forming the outside outlines fitting into a square box. The pillow block cores were made from a half box extending from the center to each end, a loose piece being inserted for the low outer end. This same box also served for the pillow block when detached from the frame pattern and used as an independent outer bearing. The straight sections of side pipes, as well as the outer end, were made from one box, stopping off to correct length. All cores, from the crosshead housing outward, were supported on chaplets and cut through on the cope side, no print being used. Shrinkage allowance of 1-16 inch per foot was made in the length of the pattern. Finish allowance for boring and planing was ¼ inch and ⅜ inch. The estimated weight of the frame casting as arranged for 72-inch stroke engine is about 15 tons.

This is an example of floor molding, a cavity the size of a small cellar being excavated in the foundry floor, and a flat cope on top. Pattern construction of this sort somewhat resembles house building on patternmaking principles. A thorough knowledge of foundry operations and the use of all modern pattern shop tools and appliances are absolute requisites for its economical production.

W. S. HAWKER.

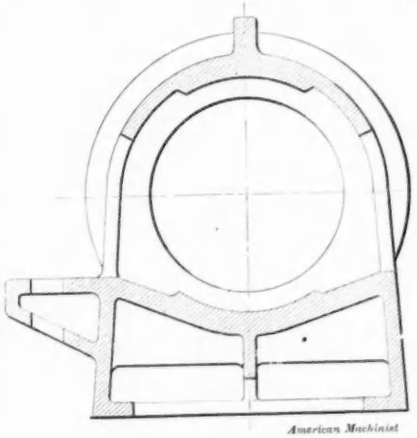


Fig. 3

SECTION THROUGH CROSSHEAD HOUSING ON *O O*.

Helping Studious Young Shopmates

Editor American Machinist:

I have been much interested in the article by F. A. Stanley in issue No. 25, and other articles that have appeared on the same general subject. While they are excellent in a general way, it seems to me that they miss the salient point of the whole argument. In the attempts of the average machinist to improve his education and "become a draftsman or designer," there is always a point (which comes very early in his efforts) at which he sticks, and sticks hopelessly, unless he has someone to give him a shove. If he fortunately obtains a good start, his chances of improvement are greatly increased.

The man whom Mr. Stanley tells us about reached his sticking point as soon as he had learned square root, and all for the want of someone to shove him, and show him the *practical* use of his *abstract* knowledge. He had probably seen the geomet-

rical formula for his case used a hundred times in the "American Machinist," but had never recognized the connection between the *algebraic* expression of the formula and his arithmetical knowledge, if, indeed, he did not "skip" the articles entirely upon seeing the formulas so expressed.

An experience of mine in helping a young machinist will interest you, I am sure. He came to me and said he wanted to use his spare time while running his lathe to study to become a draftsman. He had obtained a copy of Jones & Laughlin's hand-book, and said he thought it "no good, 'cause we did not have beams with round balls on them, and that was the only thing they showed." He had had a short course in elementary algebra, and thought that if he ever came across a beam with a ball on it, he could use the formula in the hand-book. He was one of the brighest, most promising young machinists we had, but he lacked ability to connect the abstract with the practical. He had reached his sticking point, so I began by giving him simple formulas, written out in long-hand English. Thus: Area of circle $=$ .7854 $\times$ diameter of circle squared, afterwards giving him the same thing thus: $A = .7854\,d^2$. In this way he soon reached the expressions for bending moments, torsion, moments of resistance for different sections, etc., using always examples coming under his own notice in our shop. He had access to all the drawings in the shop, but of course could not know what strains were provided for in different parts, so I adopted the following course with him: He was turning up shafting, so we began on that. He would take a shaft which he was turning up, find out the length between supports, the position of gears, etc., upon the shaft, and figure the load the shaft was good for. To his gratification he came out, in a majority of cases, surprisingly near the actual loads the shaft was designed for. He took other cases besides shafting, and always with success. In a few cases where he failed, it was because the piece had been made heavy for other reasons than for strength; so that the iron would pour well, for equal shrinkage in cooling, for large bearing area on shafts, etc. I regret that a change in business took my pupil from my notice, but I feel sure that he continued to advance, because when he stuck I pushed him from behind.

I have now in my department a young man who started in as errand boy and blueprint boy. He now occupies a table in the drafting room. I find in his case, as in the previous one, that the trouble is in the inability to connect the abstract with the practical. When he sees a formula containing a lot of *a*'s, *b* s and *x*'s, he throws up his hands and says he is no college graduate. Now, it does not take a graduate to correctly use a formula, once he has a clear notion of how to transpose the hard-looking expressions into *common arithmetic*. He cannot of course be expected to start at the foundation, and derive formulas by the calculus; but, being willing to accept a formula from good authority, the average machinist needs only the timely shove to become more than a machine hand. C. F. BLAKE.

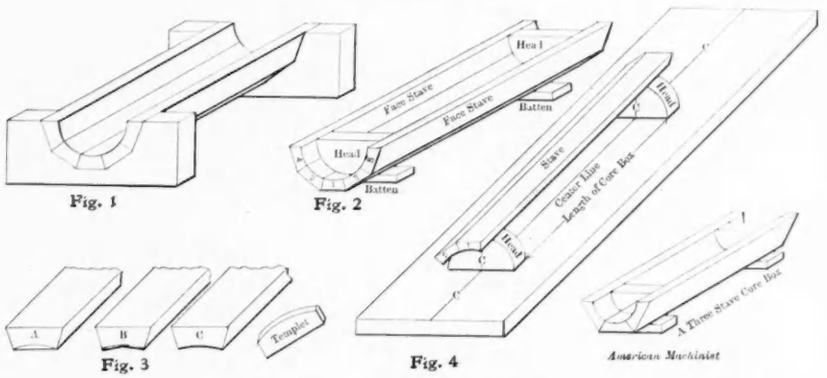
Bay City, Mich.

Making Half-Round Core Boxes.

Editor American Machinist:

I have made my share of half-round core boxes during the last twelve or thirteen years, always by the familiar methods, but within the past year I have learned a mode of constructing "staved" or "lagged" core boxes, so superior to any that I have heretofore known, that I am going to try to describe it.

Fig. 1 is supposed to represent a core box "staved up" on outside heads, the mode of construction familiar to all patternmakers and needing no description. It is drawn without ends, to show better how it is put together. Fig. 2 is a finished



MAKING A HALF-ROUND CORE BOX.

core box built according to the method about to be described.

The staves, Fig. 3, are got out in the usual way, only somewhat longer, as allowance must be made for the thickness of the ends or heads, and a lap of 2 or 3 inches beyond them. The narrow or inner faces of the staves are planed true, and the edges parallel and to the correct angle. They should be made a trifle wide, so as to leave a little stock for jointing the face of the box after it is together. The staves being planed up, the circular line of the box is laid out on the ends of each of them, *A*, Fig. 3. Two cuts on the circular saw removes most of the superfluous stock, *B*, Fig. 3. They are then worked with a round sole plane to templet, and look like *C*, Fig. 3 when finished.

Two heads are used. They are half-round, with the radius the box is to be. A center line should be made on them when they are laid out, and they should be sawed together. They can be bradded together temporarily, and should be sawed right to the line, no other finishing being necessary if the band saw is fairly good.

Fig. 4 shows how the box is put together. A center line is gaged from the edge of a straight board. The heads are set to this center line and squared from the edge of the board; the distance between the heads being the length of box required. When the heads are set they should be bradded lightly to the board, to keep them from shifting while the staves are being put on. The bottom or central stave is glued and screwed in place first, care being taken to get it central on the heads. The stave on each side of the central one is then fastened in place, the box removed from the board, turned over, and the two face staves put on. Battens are next securely fastened to the bottom stave, and when the glue has firmly set, the face of the box is jointed up, and the surplus glue removed from the inside. With very little sand-papering it is then ready to be varnished.

Core boxes can be made much more accurately this way than when they are built up first and then worked out, and, in the case of boxes that are closed at both ends, there is quite a saving in time and lumber. Where boxes are required open at both ends, it is also advantageous to use this method on account of its accuracy. Open-end boxes are put together as described above, only that the staves are got out the exact length of box required, and fastened temporarily to the inside heads, which in this case act as a follow-board. Heads are then fitted over the outside and glued fast. The inside heads are then removed, and the staves screwed to those fitted over the outside. Such a box, when finished, looks like Fig. 1.

When making boxes with closed ends, it is always best to make them with an odd number of staves, as a flat is then brought in the center to which the battens can be screwed. Where a very long box is required, it is well to use one or two extra heads to build on. These can be put in between the ends, and hold the staves in place while the glue is drying; but care must be taken that the glue from the joints between the staves doesn't run through and stick them fast, as they are to be removed as soon as the glue has set.

HOBO.

The Bellville Boilers.

Editor American Machinist:

I notice in your paper a statement from the "Pell Mell Gazette" (thus they speak it in London), owned by our late own Mr. Astor, that the "Powerful" and "Terrible" of the Royal Navy are to be *eviscerated*—which I suppose is something pretty bad, as of late I notice that the whole press of England seems to run to bad language, a fault which has previously been ascribed exclusively to us Americans.

I am sixty years old, and for forty years have been very well acquainted with engineering matters in our navy, by reason of my fifteen years in the regular service as a young man, and a life with some leisure as an old one with time for study.

In my first five years there were put into our little navy ten big ships by fantastic designers and their backers, which were complete failures, but quietly paid for; while here is England ranting over the loss of two ships out of its countless fleet.

Our chief, Mr. Ishewood, used to say, "I am always a friend to experiments, and there are no experiments so convincing as those on a large scale where we get all the conditions of actual service. I have advised the Navy Department that my *opinion* is against this machinery, but an *opinion* is not certainty. If other men wish to construct in what we think is a wrong direction, we should, nevertheless, give it all a careful trial and keep a record of the results."

Taking this view, I should say that England is wrong if she condemns these ships straight out, now they are completed, merely because they have failed in their first voyage. The causes for failure should be sought for and remedied, if possible.

Among the causes for failure in all modern marine boilers may be what seems on inspection a very slight leak of sea water into the fresh-water side of the condenser, not on ccount of salt or scale-producing, but because the boiler does all it can to eject, by foaming, this unpleasant salt, even when it is not perceptible to our sense of taste. Why this is nobody *knows*, although I might write a dozen *opinions*.

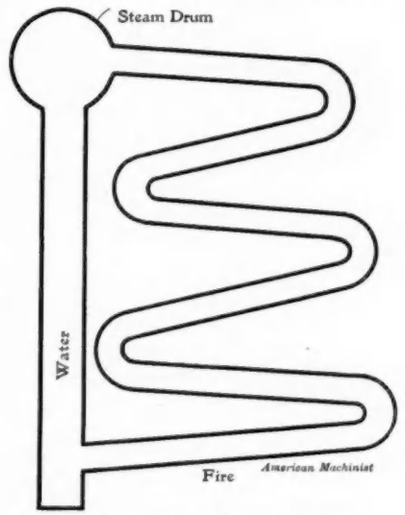
Again, a slight amount of cylinder oil passing through the condenser into the feed water will cause the boilers to foam, although sometimes it seems as if they bear oil better than salt.

Regarding the boilers themselves in the "Powerful" and "Terrible," I believe they can be left where they are and made to do very good service, by removing the supplementary mass of crude inventions with which they are loaded. These are the automatic feed-water regulators, the reducing pressure valves, the "pumps of the little horses," the outside steam and water separators, the air compressors and the "perfect combustions." Regarding these last I read Charles Wye Williams forty years ago, and then John Bourne's comments upon Charles Wye Williams.

I have experimented with many forms of smokeless furnaces, and have found that where the freedom from the smoke of soft coal depends upon the admission of additional free air, the furnace is cooled and the efficiency of the boiler is reduced.

A boiler on a locomotive or a fan-driven boiler shows the best combination of smokelessness and economy, because the air coming up through the grate, being always largely in excess of the chemical requirements of the combustible gases, the chemical combination which we call burning is immensely promoted by mechanical vibration, much as chemicals having affinities may be put in a test-tube and their chemical union promoted by shaking.

I would make possible the proper working of the simple tubular boiler shown in my last letter, by doing away with the Belleville theory of circulation of the steam and water up certain selected hot pipes and down certain cold ones (this theory enters most of the other tubular



ARRANGEMENT OF TUBES IN BELLEVILLE BOILERS.

boilers in some shape), putting in its place the theory, in accordance with the facts, that the steam and water rise together from the hottest tubes, and can be separated by giving sufficient hight through which to travel.

There should be on the front upright pipe two water-gage glasses; the upper one just below the steam drum to show water only when the steam is passing to the engine and as a certainty that the steam drum is above the water level in the tubes and glass. The lower glass may be half-way down, and is a safety against burning the lower tubes when the engine is suddenly shut down. For then the water level in the tubes may drop several feet; but there is no danger, if any water is shown in this lower glass, as in the tubes the water is very nearly solid.

WILLIAM H. HARRISON.

Braintree, Mass.

Repairing a Fusible Plug at Sea.

Editor American Machinist:

During the Spanish-American war I was greatly amused at an article which appeared in the Philadelphia "Inquirer," relating how, at the risk of his life, a brave *fireman* in one of the American warships *crawled over the red-hot fire in one of the furnaces and lay on his back with the blazing coals as a mattress,* and repaired a fusible plug which had blown out. Subsequently one of the blood and thunder melodramas got the story woven into it, and the result appeared on our fences and hoardings in the form of a highly colored poster depicting a man, stripped to the waist, lying inside a thing that looked like a case-hardening furnace, with a placid smile on his face, while he drilled holes in the roof with a monkey-wrench.

The job of plugging up a blown-out fusible plug is, or rather was, unhappily, a very common one when I was at sea; and as it may possibly be of use to some of your readers, I give you here an account of how this unpleasant, but by no means dangerous, job is accomplished.

A fusible plug, when I was at sea, was a taper brass plug, about 1 inch diameter, threaded with an ordinary pipe thread. In the center there was a taper hole about 5-16 inch diameter at the small end (this end being next the fire). The hole was filled with fusible metal (by fusible metal I mean a species of white metal having a low melting point). These plugs were screwed into the combustion chamber and furnace crowns, from the inside of, or the water space in, the boiler. Their action was that should the water through any cause get below the level of the fusible plug, the metal would run out, and the jet of steam and water which would follow would warn the engineer on watch that his water was too low.

Their action, however, is not always satisfactory; for in boilers using salt water, a coating of "salt" (which is principally lime) forms on the water end of the plug, and, even should the metal melt out, this "scale" of "salt" will sometimes withstand a pressure of 180 pounds, as I myself have seen.

The last fusible plug which I had to repair was on the Red Star liner "Waesland," homeward bound from New York to Antwerp, about six days out, when on my watch, from 12 to 4 P. M., a fireman reported a "crack" in one of the furnaces of the starboard boiler. The boilers were two in number, double ended, four fires in each end of each boiler. On examination I found the fusible plug blown out of the furnace crown. After testing the double-shut-off gage cocks, I found that water showed half glass in the boiler; so shortness of water was not the cause. I reported at once to the chief engineer, closed main stop valve and feed checks on the starboard boiler, linked the engine up to use less steam; had the fire, where the

blow was, hauled out; opened all the other fire doors and closed all the other ash-pit doors; covered all the other fires with wet coal dust (I hear the buzz of the voices of your readers saying, "Bad practice; too rapid contraction on a heated boiler;" but mail boats are in the same class as time and tide); then blew the water down below the level of the leak, thus then having nothing but moderately dry steam blowing through the hole. By this time the grate bars were sufficiently cooled by the influx of air through the ash-pit and furnace doors. Two 3x12-inch planks were then placed on the fire-bars for a man to lie on. I then got an ordinary carpenter's brace and fitted a 7-16 twist drill to it, first grinding a slight flat on the lips, so that the drill would not pull in. I then got a sheet of tin from the storeroom and punched the 7-16-inch drill through the center of it, the tin resting on the chuck of the brace. The next job was for one of the firemen to lift me into the furnace, head first, on my back. This done, the hole was easily located by feeling for it, the sheet of tin acting as a shield to protect me from the rush of steam (gage registered 50 pounds pressure). After the hole was widened out with the twist drill, a ½-inch tap was fitted to the brace and the hole tapped with brace and tin guard as before. In the meantime one of the other engineers had threaded a piece of ½-inch brass rod, tapering (with old-fashioned split dies). This, with a square end fitting the brace, was screwed in tight, nicked with a chisel, and one shot with the hammer broke it off, and the job was done. Time from start to finish, about half an hour.

You can thus see how quickly heroes are made in the merchant marine. We blew out seven plugs that voyage, the metal being either too soft or the taper of the hole too slight.

E. A. SUVERKROP.

A Valve that Wouldn't Work.

Editor American Machinist:

Small throttle valves are not very hard to get to work successfully; but when they are over 6 inches in diameter they must be wholly or partly balanced, otherwise they cannot be easily raised from their seats, or if they are of the sliding type they still move hard. It seems that there is no large throttle valve that gives entire satisfaction. Certainly there is room for improvement over any valve now made in this country.

To run a very large sawmill a 2,500 horse-power double engine was purchased. This engine required a steam pipe 18 inches in diameter, which was divided through a throttle valve into two 10-inch pipes that were connected to the steam chests of the engines. Fig. 1 shows the valve that came with the engine. The steam was to enter the chamber *A* through the 18-inch pipe, spoken of above but not shown here. It will be seen that if there had been no leak at the top of the valve into the chamber *B*, the valve would have been balanced when closed; but it seemed that it was desired to hold the valve down after it had been closed, so a ¼-inch hole was drilled through the valve, so that steam could pass into chamber *B* and thereby press the valve down, when closed, with full steam pressure over the entire area of the valve. Steam at full pressure, say 125 pounds, would have made a total pressure on the valve of over 28,000 pounds, which is a little more than a man wants to pull 2,500 times a day; this being about the number of times the valve was expected to be opened, under ordinary conditions, during a day of twelve hours. To relieve this pressure from chamber *B* a small valve was made at the lower end of the neck of the main valve. This small valve was connected to the main valve stem, so that when the main valve was to be opened, the pull on the lever opened the small valve first and reduced the pressure in chamber *B*, and then the main valve could be raised.

There seemed to be no question about the working of this valve until steam was up and the engine ready to run. The engine was started up under steam throttled at the boiler down to very low pressure, so at first there seemed to be no trouble; but when steam at full pressure was turned on and the engineer pulled the lever to open the valve, it flew open with such a force that our company came very near having to pension a widow and seven children. Another poor fellow came "within one" of not having time to say the shortest prayer he knew. The fact was, that when the small valve was opened, pressure on the main valve was reduced so much that it could be opened, and when it was once raised from its seat steam rushed under it and produced a considerable pressure before the engine could start up and before steam could leak into chamber *B*, so there was nothing to equalize this pressure under the valve; consequently the valve flew up with a tremendous force, that made it very dangerous to hold the lever. It was then thought that the ¼-inch hole was not large enough, so a ½-inch hole was put in, with the result that a man with a 6-foot lever could not open the valve.

After wiring the builder and worrying for several hours, we received a telegram stating that the builders gave the valve up as an absolute failure, and that they would send one that would work. Fig. 2 shows a section of the valve they sent. In this the small valve is done away with, and the neck of the valve is so large that steam can easily pass from below the valve to chamber *B*. It will be seen that the steam pressure on this valve is practically balanced all the time, and the entrance of steam under it does not force it up because

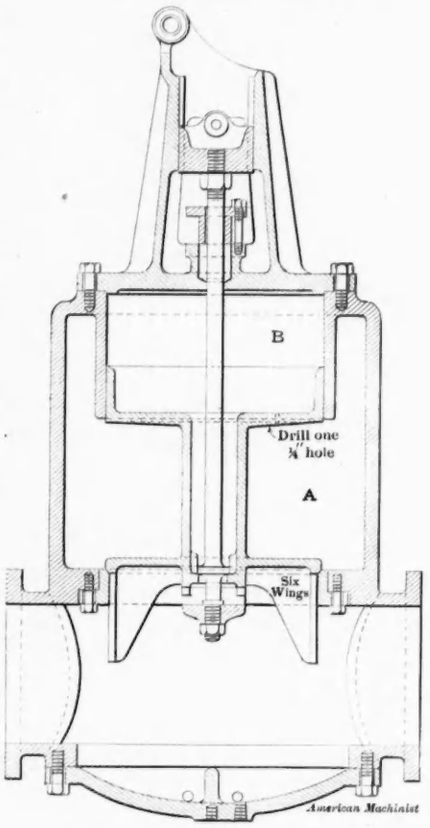


Fig. 1

A THROTTLE VALVE FAILURE.

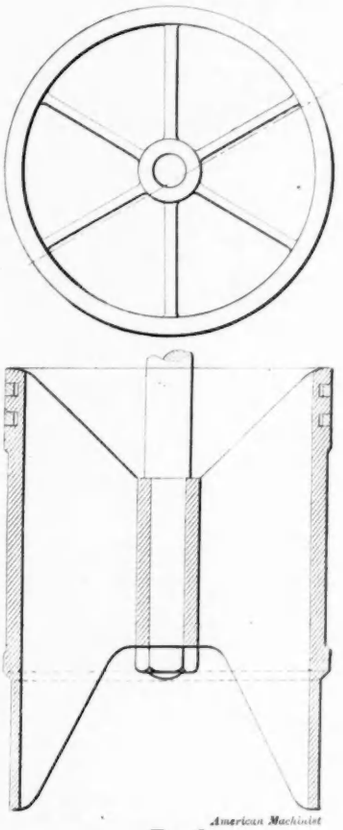


Fig. 2

THE NEW VALVE.

that steam readily passes through the neck and presses on the top as well as on the bottom. The only trouble we should expect from such a valve is the fact that it is hard to keep steam-tight. This valve leaked some at first, but after it was ground in and the packing rings fitted well we had but little trouble with it, except that its weight, even after being balanced by a counterweight, caused it to be a little hard to open and close.

A SAWMILL ENGINEER.

Chart for the Mechanical Solution of Right Angled Triangles.

Mr. J. M. B. Scheele, of Derby, Conn., sends us a very simple and obvious device, but one which we have never seen before, and which should be highly useful in every drawing office. The accompanying illustration is much reduced in size, and hence can only show the method of laying out and using the chart which, for actual use, should be constructed full size.

At the left a scale of angles reading to degrees will be seen, together with a diagonal scale by which the readings may be made to ten minutes, or, by estimation, to still finer divisions. At the right of this diagonal scale the figures read inches, and should be made full size with subdivisions to tenths. The diagonal scale is on a separate strip of paper and swivels about the apex of the triangle.

The usefulness of the instrument will be seen at once by noting the various readings as it is set in the illustration. Thus the angular reading is 22 degrees 20 minutes, and, by reading the intersection of the radial strip with the vertical from 12 inches, we see that this angle corresponds to a taper of 4.93 inches per foot. Again, reading the intersection with the vertical from 10 and pointing off a place, we see that the tangent of the angle is .41. Similarly reading the length of the vertical distance cut off at 12 on the diagonal scale, the elevation compared with the slope is seen to be 4.56 inches in 12, and a similar reading below 10 of the diagonal gives for the sine of the angle .38. Following down from 10 of the radial scale to the reading at the bottom, the cosine of the angle reads as .925.

It will be plain that readings in the reverse direction can be taken just as readily, tapers per foot being made to read as angles and the angles corresponding to various sines, cosines or tangents being read from those functions. It is obvious that nearly all ordinary shop problems connected with right-angled triangles may be solved graphically by the chart, and we have no doubt that the labor of its construction will be well repaid in any drawing office.

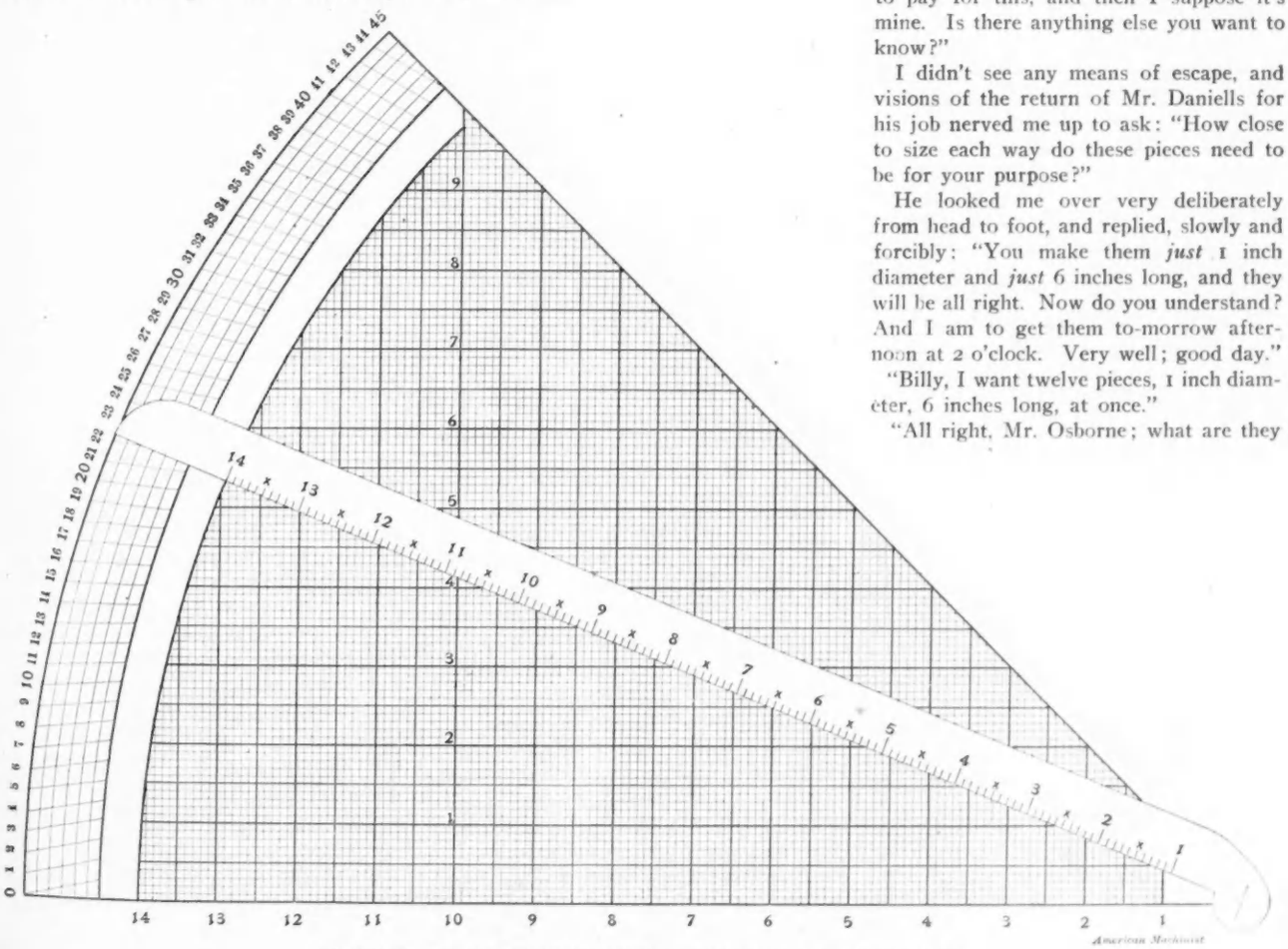


CHART FOR THE MECHANICAL SOLUTION OF RIGHT ANGLED TRIANGLES.

Echoes From the Oil Country—IV.

He was well dressed, alert, intelligent and had a general air of business and push about him. He knew just what he wanted and was evidently used to having things done how and when he wanted them—in fact, he was a man of standing and importance in his community, and his apparel proclaimed that he was far from poor.

We were always glad to see people that looked as though money was plenty with them, and I quickly turned to take his order when he enquired for the foreman.

"I wish you to make me, sir, twelve pieces of steel, 1 inch diameter and 6 inches long. I will be back through here to-morrow and wish to get them then. Have you the material to make them from, and can you have them ready by 2 o'clock? My name is Webster Daniells, and I will pay for them now if you wish."

I assured him that was entirely unnecessary. I would have them ready for him, and I would like to know what the pieces were to be used for.

"My dear young man [very patronizingly], if a man comes here and gets a job done and pays for it, can't he do as he pleases with it, or does he have to tell you where he was born and his wife's first and maiden name and when his baby cut its first tooth, before he can get it? I intend to pay for this, and then I suppose it's mine. Is there anything else you want to know?"

I didn't see any means of escape, and visions of the return of Mr. Daniells for his job nerved me up to ask: "How close to size each way do these pieces need to be for your purpose?"

He looked me over very deliberately from head to foot, and replied, slowly and forcibly: "You make them *just* 1 inch diameter and *just* 6 inches long, and they will be all right. Now do you understand? And I am to get them to-morrow afternoon at 2 o'clock. Very well; good day."

"Billy, I want twelve pieces, 1 inch diameter, 6 inches long, at once."

"All right, Mr. Osborne; what are they

for?" "Alas! Billy, I don't know, and the only man with that knowledge has escaped; but they are wanted *just* 1 inch diameter and *just* 6 inches long."

Billy looked dazed for a minute, and then said slowly, "Have you a micrometer?" I had a 1-inch one, which we took to the corner where we kept the cold-rolled shafting, and found the best bar of 1 inch was about 1½ thousandths small and about ½ thousandth out of round, and not exactly even size from end to end.

"I wonder what he wants these for. Say, Billy, did you know the man that left this order?"

"No, not much. I just heard some of the fellows down at the store say he was full of science. He just lately began coming around. I guess Walter knows him, though."

Walter only knew that his father was rich and that the younger man had been away getting an education for several years, and on one occasion had heard him talking of the unexplored depths waiting for the man of mind who could grasp the forces of nature and understand the occult, etc., etc.; said he guessed he was a believer in Keeley or perpetual motion or something; but he was smart.

All this was interesting, but didn't give me the information I needed. I thought I would chance the diameter, and told Billy to cut off twelve pieces and leave them long enough to face up true to 6 inches.

"Say, Mr. Osborne, will it hurt to have centers in these pieces?"

"I don't know, but put them in, and if he kicks we will plug them."

Billy cut off the pieces, ground the ends, carefully centered them with 'morphedites, for fear that square centering would leave marks on the outside, and then came to me again with "How will I get that 6 inches for length?"

I lent him a new Brown & Sharpe 6-inch scale and he used that to set his calipers by. After a long time he came back with the pieces nicely polished and wished me to pass on them.

"The blessed things haint all one length by about one-hundredth of an inch. They are all pretty good but two, though. Will I have to make others?" said Billy.

"No," I said, "wait until Mr. Daniells comes."

"Are those pieces ready for me?" I produced the pieces in some fear of breakers ahead.

Mr. Daniells pulled out a loose-jointed 2-foot rule, picked up one of the pieces, stuck the rule across the end and down the side, nodded, and then asked, "How much is the bill?" "Three dollars and seventy-three cents," I replied. "What! $3.73 for 6 feet of 1-inch cold-rolled shafting? Why, the stuff isn't worth over 5 cents a pound, and doesn't weigh over 20 pounds, and a man could cut it off in less than two hours and sleep when he is at it, and you charge nearly twice as much for the job. I think that is robbery; but I suppose, as I didn't know any better than to come to such a place, I will have to pay the bill; but must ask for an itemized statement of it."

I gave it to him as follows:

Twelve pieces 1-inch shafting, 17 pounds	$ .85
Foreman's time gaging, etc.	.75
Cutting off, 1 hour	.50
Centering, 1½ hours	.75
Facing and polishing, 1¾ hours	.88
Total	$3.73

My! I think I can hear him kick yet. He picked out the first and third items and said they were all he should be asked to pay. The idea of a foreman having to measure every little job after his men! And as for centering, facing and polishing pieces used for axles in wheels on a sawmill, no one that was right witted would think of it.

Axles in wheels for a sawmill, indeed!

I carefully and patiently informed him that the man who was getting up a tool to enable foremen to read the mind of a customer had not gotten his invention on the market yet, and as he had declined to tell me, I had to guess what the job was for, and it looked very much as if the guess had cost him $2.38.

I further told him that owing to his very intellectual and scientific appearance, I was convinced that nothing but the best would do for him, and that I had been under a very great mental strain for fear the job would not be good enough, as I was convinced by his appearance that he was at work on some very advanced piece of mechanism which he did not wish to impart to anyone yet, and so made the mistake of not finding out what use the pieces were to be put to.

This explanation so far molified his wrath that he paid the bill, and further informed me that he had a machine that would revolutionize existing theories on mechanics, and believed I was capable of building it, and someday he would have a talk about it with me.

Now I am living in dread of his return, and thinking very seriously of taking the course in hypnotism, mind-reading, personal magnetism, etc., so alluringly offered for $5 (reduced from $25), that will enable me to pour oil on the troubled waters and make a customer tell what I want to know and think his bill is only half big enough.

W. Osborne.

In a book bindery in Philadelphia, a few days ago, a man working about a folding machine had a couple of his fingers caught in the gears, stopping the machine and holding him secure and helpless. A fellow workman came and released him, and in the operation got his own fingers caught in the same way. The men later each had two fingers amputated at the hospital.

The South African Outlook.

The commercial results of the war in South Africa are a gigantic gamble. Whether the men of trade early on the field are going to accumulate untold profits or whether the boom is fated to prove a fiasco, as did that following the Cuban war, is chiefly a matter of guess work, but opinions that come nearest to having some authoritative value must be pondered for all that they are worth in forming a conclusion how heavy risks ought to be assumed in entering the market. Advance sheets of a report from Consul-General Stowe at Cape Town, which we have received from Washington, contain an optimistic view of the ultimate outlook for American trade in South Africa. We print portions of it herewith:

"The average of imports from the United States has been maintained, even with the non-purchase of the many lines of goods that went to swell the imports of 1898. When the war is over an interim may be expected during which a state of uncertainty will exist as to the *modus operandi* of the British Government, either in the direct control of conquered territory or only quasi control; but when all questions for the future guidance of affairs are settled, when many of those who have left the country return, when the gold and diamond mines are again in full operation, yielding more largely than ever, and when the agricultural resources are better developed, the outlook will be bright, and the country will witness an advance in business never before experienced. There will be an impetus given to the importation of goods of all kinds, not only in order to restore stocks to their original quantities, but also by reason of the increase of capital. I quote from the 'British and South African Gazette:'

"'The optimism that prevails among British manufacturers generally as to the great commercial future that is before South Africa when the war is over and British supremacy reigns supreme from the Cape to the Zambesi is highly refreshing, and is in marked contrast to the feeling of depression under which they have labored for the past eighteen months. They argue that, if left to work out its own destiny undisturbed by the recurring troubles of the past few years, with settled and enlightened government, the expansion that must result by reason of South Africa's vast mineral wealth alone, irrespective of the other industries that will speedily open up, cannot fail to result in a trade boom which will be unparalleled in the history of our commerce. Moreover, directly peace is declared, they say, the demand for goods of every description will be instantaneous, owing to the fact that stocks all round are at their very lowest ebb and will need immediate replenishing so soon as communication with the several centers is restored.'

"For that time, the manufacturers and

producers of the United States should prepare, not by flooding the country with circulars and price lists, but by sending men, or by working through the export commission houses of the United States which have men here constantly and are subject only to the criticism that they perhaps represent too many lines of goods to do justice to all, or that they are unable, in justice to older clients, to represent similar lines of goods produced by different manufacturers. It is not to be expected that the export commission houses will ever endeavor to become salesmen for cold storage, mining, electric light, street car, or other outfits, and heavy machinery, such as steam railway supplies, rolling stock, and many other articles of great bulk, for they have enough to do in the lines of smaller goods and food supplies.

"The United States has for only a few years had any considerable part in foreign trade outside of food stuffs, and much of this has sought her and much has been obtained through the export commission houses which make it their business to seek such trade. Even with what may be called 'scratching the surface,' the results have been very satisfactory. That other nations are jealous is evidenced by their present activity in preparing for the capture of trade in South Africa after the present war. Owing, I presume, to the increased price of coal at South African ports, to the inability to obtain coal supplies, and to the serious detention to which steamers are being subjected therein, the rates of freight from New York have been raised by 5s. ($1.21) per ton on all classes of cargo from the 16th of May—except oil and lumber, which have been raised by 20s. 6d. ($4.99) per ton."

The consul alludes also to the discussion whether the British Government, by some such system as a "fiscal federation of the empire" shall take measures to give preference to British manufacturers in the markets of South Africa. We shall await with interest the results of this test of sincerity on the part of the nation which has clamored so loudly for the "open door policy" in the East, a test which, by the way, is also to be applied in the new "colonies" of a nation which has assumed to admire and applaud this policy.

Shipbuilding Prospects.

A circular calling for bids on six new armored cruisers was issued by the Secretary of the Navy August 1. Three of these were authorized by the act of March 3, 1899, with a limiting cost of $4,000,000 each, to be sheathed and coppered; but the circular calls for alternative bids based upon the absence of the sheathing and coppering. The latter three vessels were provided for by the act of June 7, 1900. Their cost is limited to $4,250,000 each, and they are to be unsheathed.

The plans will be ready for distribution to the bidders November 8, and the bids will be opened December 7. No bids will be considered which propose to furnish vessels of less than 13,400 tons trial displacement for unsheathed vessels and of less than 13,800 tons trial displacement for sheathed, or of less than 22 knots speed and a bunker capacity of 2,000 tons. The maximum time allowed for completion is thirty-six months for each vessel, with penalties of $300 per day for each day in excess of that time for the first month and $600 for each subsequent day. For deficiency of speed not below 20 knots the vessels will be accepted at a reduced compensation of $50,000 for each quarter knot to 21½ knots, and $100,000 per quarter knot down to 20 knots.

The vessels will have twin screws and will be fitted throughout with the most modern machinery. The main batteries will consist of four 8-inch breech-loading rifles of 45 calibre length and fourteen 6-inch breech-loading rapid-fire rifles of 50 calibre length. The secondary batteries will consist of eighteen 3-inch breech-loading rifles, twelve 3-pounder guns, four 1-pounder automatic guns, four 1-pounder single-shot guns, two 3-inch field guns, two machine guns, six automatic guns, and two submerged torpedo tubes.

Curiosity may be entertained as to the part the new factor at Camden, N. J., the New York Shipbuilding Company, will play in the construction of these vessels. That company is rapidly getting its large and fine plant into shape and will, no doubt, welcome the present opportunity as a favorable one for making its debut. The outcome will help to settle the question how formidable a rival of the Cramps the new concern will prove.

There is likely to be enough work in the shipbuilding field for both of them, and more too. That industry seems to us to be the one whose future can to-day be looked forward to with more confidence than that of almost any other. The bellicose spirit of Germany, the United States and other nations will insure continual naval increases. That the merchant marine of this country will also be extended is certain, in view of the new trans-oceanic relations, both political and commercial, which we have assumed. If a slump in domestic business should come, not only would military expenses go on as usual, but the merchant service might be directly benefited, since manufacturers would give increased attention to foreign markets for an outlet for their goods, as they did during the last depression. The shipbuilding industry appears, therefore, the one of all others best fitted to survive a panic.

The annual report of the Cramp Ship and Engine Building Company, just made public, shows that although dividends for 1899-1900 were raised from 2½ to 5 per cent. as compared with the previous fiscal year, the surplus rose to from $210,050 to $293,862. Improvements and enlargements are under way, including the building of a power house which, the president's report says, will be the most perfect of its kind.

Questions and Answers.

Name and address of writer must accompany every question. Questions must pertain to our specialties and be of general interest. We cannot undertake to answer by mail.

(18) A. B. C. writes: Some of the recent arithmetics give the meter as equal to 39.37043 inches, while other books give the old 39.37079. The United States Government in all its conversion tables uses simply 39.37. Can you tell me where the books get the 39.37043, or what the latest authorization is upon the subject, and how it is reached? A.—George M. Bond, of Hartford, Conn., answers this question as follows: The relation of yard to the meter of 39.37043 is that given by Clarke, and, as stated in Trautwine, is the figure adopted by the United States Government, while 39.37079 is that deduced by Kater, and is the ratio most generally used. According to the United States Coast and Geodetic Survey Bulletin No. 9, these relative values when reduced to terms of the relation of the imperial yard to the committee meter would read thus: Kater, 39.36990 inches; Clarke, 39.36970 inches. The original Kater relation, as above stated, is most generally adopted and used, and is certainly as nearly accurate as is required for practical purposes.

Personal.

The Chicago Pneumatic Tool Company has engaged Mr. Fred F. Bennett as sales agent and manager of advertising, with headquarters at the main office of the company, Monadnock Building, Chicago. Mr. Bennett resigned a position as sales agent for the American Steel Casting Company and American Coupler Company, of Chester, Pa., the change taking effect July 1. He has had an extensive newspaper experience, and for several years was Western representative of the Railroad Gazette.

Technical Publications.

"American Foundry Practice, Treating of Loam, Dry Sand and Green Sand Molding, and Containing a Practical Treatise upon the Management of Cupolas and the Melting of Iron." By Thomas D. West. New York, John Wiley & Sons. 418 7½x5-inch pages. Illustrated. Price $2.50.

That this book, first issued in 1882, a most practical work by a most practical man, should still be in as great demand as ever, so that a tenth edition of it now appears, is evidence of the appreciation which it has earned and merited. This book has had an important share in the promotion of the great improvements in foundry practice in the last score of years, and especially in bringing the many approximately to the standards of the most successful few. The progress of the years has not seemed to make any page of the work obsolete, which shows the correct

and substantial foundation upon which it was built. The book is much improved by the addition of a very complete index.

"La Traction Mécanique et les Voitures Automobiles." By G. Leroux, ingénieur chef du service de la traction méchanique C. G. O., répétiteur à l'Ecole centrale, and A. Revel, ingénieur à la Compagnie générale des Omnibus. 394 pages, 4½x7 inches, 108 illustrations. Paris: J.-B. Baillière et Fils, 19, rue Hautefeuille. Five francs.

This is a little book in French describing the progress of the different systems of mechanical traction applied to tramcars and to horseless carriages. It is intended to conform to the capacity of the general reader.

"The Knight of the Grip; Being a Series of Dissertations on His Conditions, Character and Conduct as They Appear to an Ordinary Chap Who Has Studied Him." Reprinted from "The Iron Age." New York, David Williams Company. 179 pages, 7½x5 inches, numerous cuts. Price, 60 cents.

This book is all right. The preface, which thoroughly matches, is as follows: "This book is not intended to instruct. There is not a word of advice in it. It is not humorous. The construction of its sentences would cause a lover of pure English to shed tears. If it has any merit, it lies in the fact that it treats of a lot of rattling good fellows, and contains the honestly recorded impressions of a dozen years of intimate association with them. Every incident is from life. It may serve to while away an idle hour." The book contains many valuable hints and suggestions, both for the traveling salesman and for the one who sits in the home office.

Steel or iron instruments or weapons meant for use in the tropics should be kept in cases without linings. Velvet, silk, plush, cloth or leather linings all absorb moisture and cause the instrument to rust. Nothing will keep them so well as linings of baywood or other absorbent timber, which has been well painted, while hot, with a melted paraffine wax. No wax need remain on the surface, but if the pores are properly filled the trouble and loss due to rusting of valuable instruments or weapons may be avoided.—"Indian Import and Export Trades Journal."

Mr. Carl Linde has given out some particulars concerning the production of liquid air. He states that by the aid of the "double cycle," in which the greater mass of the air circulates between two high pressures, 3 horse-power will produce 1 kilo (2.2 pounds) of liquid air per hour in the smaller apparatus, while in the larger apparatus the work required is less. The record of the largest machine yet tried is 50 kilos per hour for a little less than 100 horse-power, or a trifle less than 2 horse-power per kilo.

Water is getting scarce in Brooklyn, and the Water Commissioners have on that account ordered it to be shut off from a number of school buildings in which "summer schools" were being held. We wonder if these commissioners imagine that when these children are turned out of school into the streets or kept at home they will use materially less water than when at school. We imagine they will use just about as much as ever. Children are not abolished by being shut out of school buildings.

McJigger—What do you think of that Delaware mechanic who discovered the secret of perpetual motion in a dream?

Thingumbob—Oh, I suppose he'll wake up some morning.—"Philadelphia Press."

New Catalogs.

The Joseph Dixon Crucible Company, Jersey City, N. J., sends us a little pamphlet devoted to graphite as applied in mold facings and core washes. Size, 5x7 inches.

The Sterlingworth Railway Supply Company, Easton, Pa., has gotten out a new brochure containing an imposing illustration of a rolled-steel car and also cuts of its brake beams, rolled-steel bolster and rolled-steel truck. Size 16x8 inches.

Ransome & Smith Company, 17-19 Ninth street, Brooklyn, N. Y., sends a pamphlet descriptive of Ransome's patent concrete mixers. These are of two distinct types, represented by the drum and the continuous mixers. Size, 6½x5¼ inches.

The C. W. Hunt Company, West New Brighton, Staten Island, N. Y., has issued pamphlet No. 008, which is intended as a brief introduction to its varied line of machinery adapted to handling heavy or bulk materials. Size, 3⅝x6 inches.

William Bayley & Sons Company, 732-776 Greenbush street, Milwaukee, Wis., sends its Catalog No. 30 of steel plate exhaust fans for planing mill and other purposes, blowers, countershafts, blast gates, steam traps, dry kilns and appliances, etc. Size, 6¾x8½ inches.

The Cleveland Crane & Car Company, Cleveland, O., manufacturer of hand and power cranes of all kinds, electric hoists, plantation cars, rolling-mill cars, etc., sends us Catalog "B," which is designed to give in brief an idea of their three-motor electric traveling cranes. Size, 9¼x6¾ inches.

John Davis & Son, All Saints Works, Derby, England, and 140 West Fayette street, Baltimore, Md., send us the first American edition of their catalog, section "A," 1900, representing their specialties in transits, miners' dials, levels and surveying instruments generally, including mathematical drawing instruments, anemometers, water gages, miners' safety lamps, etc. Size, 8½x11¼ inches.

Miscellaneous Wants.

Advertisements will be inserted under this head at 25 cents a line, each insertion. Copy should be sent to reach us not later than Saturday morning for the ensuing week's issue. Answers addressed to our care will be forwarded.

Gear Wheels, gear cutting. Grant; see p. 20.
Dies & punches. Amer. Hdw. Co., Ottawa, Ill.
Caliper cat. free. E. G. Smith, Columbia, Pa.
Forming lathes. Mer.Mach.T.Co.,Meriden,Ct.
Punches & dies. Wal.M.Wks.,Waltham,Mass.

Wanted—Copy "Barr's Pumping Machinery." Algoma Iron Works, Soo, Ont.

Light and fine mach'y to order; models and elec. work specialty. E. O. Chase, Newark, N. J.

Book "Dies and Diemaking," $1, post paid. J.L.Lucas,Bridgeport,Ct. Send for index sheet.

F. J. Stokes Machine Co., 13th and Noble sts., Philadelphia, Pa., build light machinery.

Selden Packing for Stuffing box, with or without rubber core. Randolph Brandt, 38 Cortlandt st., New York.

Wanted—Parties with facilities to manufacture medium and heavy high-grade machinery. Address "Phila.," care AM. MACH.

Wanted to Sell at Once—A complete Mech. Scholarship of the Int. Nat. Cor. Schools, with bound vols. Address Student, care AM. MACH.

Wanted—A lathe that will swing 24 inches over the carriage and 10 feet between the centers. Address Fort Orange Paper Co., Castleton, N. Y.

Choice Factory Site.—In Jersey City, N. J., 2 acres, close by switch, C. R. R. N. J.; on trolley route; near M. & E. Canal. Address "B.," AMERICAN MACHINIST.

Good, practical machinist wanted to run machine shop of his own in central part of Wisconsin; must have $3,000 capital; good business and location. Box 175, AM. MACH.

Water-front property and well-equipped iron or steel shipbuilding plant and machine shop, within 25 miles of New York City, for sale or rent. Address Box 216, AM. MACH.

Gear and Milling cutters, adjustable reamers and special tools; vertical millers, cutter and surface grinder and shears. Catalog of small tools free. R. M. Clough, Tolland, Conn.

Wanted—Staple articles to manufacture requiring light machine work; brazing, hardening, plating and enameling facilities, with brass foundry and wood shop connected. Address Box 197, AMERICAN MACHINIST.

Attention!—Engineers, contractors, builders and inventors: We are prepared to make drawings for you from sketches, specifications or descriptions; accurate, rapid and neat work guaranteed. M. & G., AMER. MACHINIST.

Invention.—For Sale—Whole or part of adjustable screw die holder; will cut seven different sizes with one set of chasers; patent is allowed; capital wanted to patent it in other countries. Address J. Bradley, Stamford, Conn.

Institutions retiring from business having machine tools, brass and wood working machinery will find it to their interest to correspond with us. We purchase complete plants or handle them on com. C. C. Wormer Mach. Co., 55-59 Woodbridge st., W., Detroit, Mich.

Wants.

Situation and Help Advertisements only inserted under this head. Rate 25 cents a line for each insertion. About six words make a line. No advertisements under two lines accepted, and no advertisements abbreviated. The cash and copy should be sent to reach us not later than Saturday morning for the ensuing week's issue. Answers addressed to our care will be forwarded. Applicants may specify names to which their replies are not to be forwarded; but replies will not be returned. If not forwarded they will be destroyed without notice. Original letters of recommendation or others papers of value should not be inclosed to unknown correspondents.

Situations Wanted.

A successful machine-shop foreman is open for engagement. Box 196, AMER. MACHINIST.

Experienced draftsman, age 22, desires chance to become specialist. Box 202, AM. M.

Draftsman, experienced on automatic machinery; technical preferred. Box 224, AM. M.

Wanted—Situation as foreman pattern-maker, by one having 18 years' experience at pattern making; 8 years as foreman; can handle men successfully. Box 203, AM. M.

Wanted—Position as salesman, by a technical graduate, with 4 years' shop and drawing-room experience, also experience as salesman; junior M. A. S. M. E. Box 225, AM. MACH.

Toolmaker, machinist and special machine designer wishes position as foreman or superintendent; expert on automatic machinery and tools (screw machines). Box 218, AM. M.

Foreman, experienced in designing special machinery, tools and fixtures for manufacturing purposes, wants to change; middle-aged, technical and practical. Box 221, AM. MACH.

Mechanical engineer desires responsible position; technical education and 15 years' experience; expert in mining machinery, both design and construction. Address Box 223, AMERICAN MACHINIST.

Assistant superintendent of a large boiler